

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF VIRGINIA
ALEXANDRIA DIVISION

-----x
UNITED STATES, et al., : Civil Action No.:
: 1:23-cv-108
Plaintiffs, :
versus : Tuesday, September 24, 2024
: Alexandria, Virginia
GOOGLE LLC, : Day 12 a.m.
: Pages 1-154
Defendant. :
-----x

The above-entitled bench trial was heard before the
Honorable Leonie M. Brinkema, United States District Judge.
This proceeding commenced at 9:00 a.m.

A P P E A R A N C E S:

FOR THE PLAINTIFFS: GERARD MENE, ESQUIRE
OFFICE OF THE UNITED STATES ATTORNEY
2100 Jamieson Avenue
Alexandria, Virginia 22314
(703) 299-3700

JULIA TARVER WOOD, ESQUIRE
AARON TEITELBAUM, ESQUIRE
RACHEL HANSON, ESQUIRE
JEFFREY VERNON, ESQUIRE
UNITED STATES DEPARTMENT OF JUSTICE
ANTITRUST DIVISION
450 Fifth Street, NW
Washington, D.C. 20530
(202) 894-4266

(State of VA) TYLER HENRY, ESQUIRE
OFFICE OF THE ATTORNEY GENERAL
OFFICE OF THE SOLICITOR GENERAL
202 North Ninth Street
Richmond, Virginia 23219
(804) 786-7704

A P P E A R A N C E S:

FOR THE DEFENDANT: CRAIG REILLY, ESQUIRE
LAW OFFICE OF CRAIG C. REILLY
209 Madison Street
Suite 501
Alexandria, Virginia 22314
(703) 549-5354

KAREN DUNN, ESQUIRE
JEANNIE RHEE, ESQUIRE
WILLIAM ISAACSON, ESQUIRE
LEAH HIBBLER, ESQUIRE
PAUL, WEISS, RIFKIND,
WHARTON & GARRISON LLP
2001 K Street, NW
Washington, D.C. 20006
(202) 223-7300

COURT REPORTER: STEPHANIE M. AUSTIN, RPR, CRR
Official Court Reporter
United States District Court
401 Courthouse Square
Alexandria, Virginia 22314
(607) 743-1894
S.AustinReporting@gmail.com

COMPUTERIZED TRANSCRIPTION OF STENOGRAPHIC NOTES

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

TABLE OF CONTENTS

WITNESSES

On behalf of the Defendant:

PAUL MILGROM

Direct examination by Ms. Rhee16
Cross-examination by Mr. Vernon139

EXHIBITS

On behalf of the Plaintiff:

Admitted

Number 528146

On behalf of the Defendant:

Admitted

Number 253621
Number 207726
Number 2077A33
Numbers 117, pages 115 through 14858
Number 8060
Number 40571
Number 57886
Number 2085116
Number 2085A118
Number 705123
Number 298129

MISCELLANY

Proceedings September 24, 20244
Certificate of Court Reporter154

P R O C E E D I N G S

THE DEPUTY CLERK: Civil Action Number
1:23-cv-108, United States of America, et al. versus Google
LLC.

Will counsel please note their appearance for the
record, first for the plaintiff.

MR. HENRY: Good morning, Your Honor. Ty Henry
from the Virginia Attorney General's Office on behalf of the
plaintiff states.

THE COURT: Good morning.

MS. WOOD: Good morning. Julia Tarver Wood from
the Department of Justice on behalf of the plaintiffs. With
me are my colleagues Aaron Teitelbaum, Jeff Vernon and
Rachel Hanson, and from the U.S. Attorney's Office,
Gerard Mene.

THE COURT: Good morning.

MS. DUNN: Good morning, Your Honor. Karen Dunn
for Google. And with me is Jeannie Rhee, Leah Hibbler,
Craig Reilly, Bill Isaacson and Matt Spalding.

THE COURT: Good morning.

MS. DUNN: Good morning.

THE COURT: All right. Do we need to do
housekeeping? I hate that term, especially because of the
women attorneys and a woman female judge. We've got to stop
that.

1 MS. DUNN: Thank you, Your Honor.

2 MS. WOOD: Agreed, Your Honor.

3 MS. DUNN: I think we should instead take this
4 moment to celebrate the numerosity of women attorneys.

5 THE COURT: Here, here.

6 MS. DUNN: Yes, Your Honor. And apologies for
7 bringing this up in the morning and not the afternoon, but I
8 think Your Honor will see why we need to raise it now.

9 So, first of all, subject to this issue, we are
10 happy to report we are on track to hopefully finish on
11 Thursday. Obviously subject to plaintiffs cross of
12 primarily our experts, and we don't know the duration of
13 that.

14 So the issue to raise with the Court this morning,
15 and we're raising this because there are several we would
16 like to start to get into the record today, our deposition
17 designations.

18 Our position is that in Google's case in chief,
19 the DOJ should be able to counter our affirmative
20 designations because they're witnesses that we are calling
21 that the DOJ or plaintiffs opted not to call in their
22 affirmative case in chief. So our position is that we
23 should be able to play our affirmative designations, and the
24 plaintiffs, because it's cross-examination, should be able
25 to counter.

1 Plaintiffs' position is that they should be able
2 to go beyond proper counter-designation to affirmative
3 testimony.

4 MS. WOOD: With respect, Your Honor, I would like
5 to explain plaintiffs' position for myself.

6 THE COURT: All right.

7 MS. DUNN: As we understand it.

8 For background, Your Honor, in plaintiffs'; case
9 in chief, they played 13 deposition designations. Of those
10 witnesses, five of them were also listed on Google's witness
11 list filed with the Court. And so accordingly for those
12 five, we designated counter-designations to their
13 affirmative designations and our affirmative designations
14 that we would have played in our case in chief.

15 For the other eight, we -- who are not on our
16 witness list that we were not going to call, we submitted
17 only proper counters consistent with Rule 611(b), and that
18 is how it should be.

19 So what our plan is -- for the Court is to submit
20 affirmative designations. We have fewer witnesses in this
21 category than the 13 that the plaintiffs had, somewhere
22 along nine or ten, trying to look for cuts.

23 Those -- nine of those ten appeared on plaintiffs'
24 witness list, but plaintiffs affirmatively chose not to call
25 them in their case in chief. That was their choice. We

1 would now call them.

2 One of those witnesses was not even listed on
3 their witness list. And so what -- there is an opportunity
4 obviously for the plaintiffs to have a rebuttal case, and so
5 if there is more testimony that is proper rebuttal to our
6 affirmative case, they could be permitted to play it then if
7 Your Honor thought it was proper rebuttal.

8 But at this point they have rested, and we would
9 like to be able to put in our affirmative case with them
10 permitted to cross the witnesses.

11 THE COURT: Hold on.

12 So you have a deposition where you're going to
13 read -- we're going to read the direct examination just as
14 if this person were here.

15 MS. DUNN: Portions of, yes.

16 THE COURT: Portions of.

17 And then in a normal course, the government would
18 then be able to cross-examine that witness; right? Based
19 upon what came out during the direct.

20 MS. DUNN: Yes. And the key there, Your Honor, is
21 based on what came out in the direct. And what is happening
22 is that what plaintiffs would like to do is go well beyond,
23 in some circumstances very well beyond, the scope of the
24 direct designations that we are putting in, which is not
25 permissible under the rules and also adding time. And

1 they -- this was their choice to put on their affirmative
2 case, but this is now our affirmative case. So we would
3 like for them to be limited to the scope of our direct.

4 THE COURT: All right. Let me hear now from
5 Ms. Wood.

6 MS. WOOD: So, Your Honor, a couple of things.

7 First of all, the Court will recall that in our
8 case in chief, there were deposition designations and they
9 included both sides' affirmative designations, not just
10 ours. We have largely been abiding by -- or entirely been
11 abiding by the one witness -- witnesses called only once
12 during the course of the trial, and that, we believe, should
13 apply to depositions just like a live witness. And during
14 our entire case in chief, we read into the record
15 affirmative testimony designated by the defendants on the
16 one witness at a time.

17 Similarly, Your Honor has applied that rule in
18 terms of scope on cross-exam and things like that because
19 we're all attempting to see as efficient as possible.

20 It seems to me highly inefficient to have portions
21 of a deposition played today or tomorrow and then further
22 portions of the deposition played on Friday or whenever we
23 get to our rebuttal case.

24 If that is the Court's preference we will of
25 course adhere to that, but consistent with the principles

1 that have been applied throughout for the one-witness rule,
2 we think that's inefficient and unnecessary.

3 In addition, we also note that the rule of
4 completeness would say that all the material be presented
5 once. There's a Sixth Circuit case we can show Your Honor
6 in that regard that talks about the rule of completeness.
7 And I think the notion of what material constitutes a
8 counter versus an affirmative, counters in this case and
9 cross has been fairly wide open, and so then we're just
10 going to end up in debates with each other and potentially
11 the Court about what is a counter versus an affirmative
12 point.

13 THE COURT: Let me ask you this, Ms. Dunn.

14 MS. DUNN: Yes.

15 THE COURT: Since the depositions are, to some
16 degree, substituting for a live person being here in court,
17 you have your direct, government gets its cross, you can do
18 redirect, and they can do recross.

19 So if I allow the government to go forward and put
20 in all of the cross that they want and I allow you then to
21 come back basically on redirect. If there's additional
22 portions of the deposition that respond to that extra
23 material, I mean, we're sort of bending the rules a little
24 bit here, but in terms of evening the playing field, it may
25 lengthen things, but doesn't that resolve the issue?

1 MS. DUNN: Your Honor, that does not solve the
2 issue and also I believe is not consistent with the civil
3 rules.

4 So, first of all, the way that Google has
5 conducted itself is for witnesses that we were going to
6 call, we did go beyond the scope because we would have
7 called them in our affirmative case. For witnesses that we
8 were not going to call, we only did our counters, so a
9 proper cross-examination.

10 What the government is proposing, having rested
11 their case and chosen not to call these witnesses, is to go
12 well beyond the scope and then -- and what is being
13 suggested now is we would somehow try to redirect a non-live
14 witness based on what is in the deposition transcript.

15 And so a lot of work has already been done to make
16 these deposition transcripts concise for the Court so that
17 we can get done on Thursday, and we just don't think that
18 the plaintiffs should be able -- contrary to the civil
19 rules, to go back in time as if somehow they had called
20 these witnesses in their affirmative case.

21 Second of all, to the extent what they're trying
22 to do is tack on their rebuttal case, they have, maybe
23 correctly, taken the position they don't know what rebuttal
24 they have yet because we haven't put our case on. So what
25 they're really trying to do is to jam in a bunch of other

1 testimony that they elected to not put on in their
2 affirmative case.

3 So in this circumstance, we would ask the Court to
4 enforce what the rules actually are that we abided by during
5 their case and be able to enforce this.

6 If there's things that are true rebuttal that --
7 you know, that they would need to play, then they can play
8 that. But at this point, having lived by the rules both of
9 this case and of civil procedure, we would just like it to
10 apply also to the plaintiffs.

11 THE COURT: Now, the deposition transcripts that
12 you have right now, again, these are going to be read in or
13 are these video that are going to be played?

14 MS. DUNN: It is a mix for variety and
15 comprehensibility. Sometimes the videos are harder to
16 understand than having a read-in. So it's a mixture. And
17 we're trying to not make it, you know, a boring day. So we
18 try to change it up a little bit.

19 THE COURT: Can you give me an approximation?
20 Like, the first of deposition we're talking about is of
21 whom?

22 MS. DUNN: So we have -- I will say that for
23 today, we have chosen depositions where there is not much
24 content in dispute so that we could just get on with it.

25 So today the -- BuzzFeed and Criteo I think are

1 the ones where, you know, there's not that much content in
2 dispute. But there are some depositions for which there's
3 quite a lot of material in dispute because the plaintiffs
4 are trying to affirmatively designate material that really
5 has nothing to do with the affirmative designations.

6 THE COURT: All right. Have the transcripts been
7 prepared in such a way -- I've had other cases where the
8 defendant's designations are in one color and the
9 plaintiffs' are in another color. Or, in this case, where
10 there was an agreement as to a whole bunch of pages, that
11 could be in one color, and then those extra pages that the
12 government is trying to do in a separate color so that I can
13 see exactly what we're talking about.

14 Why don't we do this, since the two short ones
15 shouldn't be a big problem today.

16 MS. DUNN: Yes, Your Honor.

17 THE COURT: Overnight, take one of the depositions
18 where there is this very significant problem and color code
19 it.

20 I mean, I think basically all that would have to
21 happen then is for the government to outline those extra
22 pages that the government wants read in. Because you had
23 agreed, I assume, before today or before recently --

24 MS. DUNN: Right.

25 THE COURT: -- to a joint reading, the way we've

1 been doing it; right?

2 MS. DUNN: Yes.

3 THE COURT: Okay. So that's all set.

4 MS. DUNN: Right.

5 THE COURT: So I just need to be able to see what
6 additional pages the government now wants to be read in and
7 then we can review that. If you can get that to us -- since
8 we're ending early today, this would be a good night to do
9 that; okay?

10 MS. DUNN: Yeah.

11 THE COURT: And as you all do it, both sides can
12 be thinking about whether it's really necessary. As I said,
13 I'm getting a bit cranky about overlap. All right. I've
14 heard it once, I've heard it several times. I don't need to
15 hear it ten times. And so both sides need to be, you know,
16 careful about that; all right?

17 MS. DUNN: Yes, Your Honor. And I'm sure that the
18 teams who are working back at the offices can start working
19 on this now.

20 THE COURT: The sooner you get it to us, the
21 better. If you can get one to us before 5:00 tonight, I can
22 look at it overnight and be right ready to rule on it
23 immediately.

24 MS. DUNN: Appreciate it.

25 THE COURT: If you can get it to chambers tomorrow

1 morning by 7:30, I'll also be able to try to give you a
2 readout by 9:00.

3 MS. DUNN: I just want to, for clarity, so the
4 people that are actually doing this will understand.

5 THE COURT: Right.

6 MS. DUNN: So we're going to put our affirmative
7 designations plus what the, you know, proper counters would
8 be in one color because that's what's agreed upon by the
9 parties; and then in a second color, we will put the DOJ --
10 you know, what they would propose to additionally designate;
11 is that fair, Your Honor?

12 THE COURT: Ms. Wood, do you understand what I'm
13 saying there?

14 MS. WOOD: I understand. It will be a little
15 misleading because some of what they're putting in their
16 color will actually be what we have counter-designated that
17 they've agreed to.

18 THE COURT: I don't care about that. Where
19 there's an agreement, I don't need to really look at that as
20 much as I have to look at -- I mean, I have to get a sense
21 of what you've agreed to, and then I have to take a look at
22 what the government wants to add beyond your agreement to
23 see, first of all, whether I think it adds anything, whether
24 it still, in my view, would fall within the gambit of
25 appropriate cross-examination, you know, reading generously,

1 or whether I think it's irrelevant, cumulative, whatever.
2 All right. So I can get you a good reading on it and we
3 don't have to spend a lot of time in court.

4 MS. WOOD: The only other point I would make, Your
5 Honor, is that the parties did actually have an agreement on
6 multiple of these depositions in writing. We can show you
7 the emails.

8 THE COURT: Yeah.

9 MS. WOOD: And Google has decided to recant that
10 agreement that we had over the weekend.

11 THE COURT: Look, you've all done so well. We
12 don't need that.

13 MS. WOOD: All right.

14 THE COURT: We're going to go forward with what
15 I've suggested.

16 MS. DUNN: Thank you, Your Honor. We appreciate
17 the Court's indulgence in involving itself in this exercise.

18 THE COURT: You have to find a new word; remember?

19 MS. RHEE: It is going to be not housekeeping.

20 THE COURT: Oh, non-housekeeping.

21 MS. DUNN: Indulgence or exercise. Oh,
22 non-housekeeping.

23 Your Honor, are you okay if we proceed?

24 THE COURT: Yes.

25 MS. DUNN: Google calls Paul Milgrom.

1 THE COURT SECURITY OFFICER: Face the deputy
2 clerk. Raise your right hand.

3 Thereupon,

4 PAUL MILGROM,
5 having been called as a witness on behalf of the defendant
6 and having been first duly sworn by the Deputy Clerk, was
7 examined and testified as follows:

8 (Time noted: 9:15 a.m.)

9 THE DEPUTY CLERK: Thank you.

10 THE COURT SECURITY OFFICER: You may be seated.

11 THE COURT: I assume we have books?

12 THE WITNESS: What's that?

13 THE COURT: No, I'm speaking to counsel.

14 MS. RHEE: Oh, yes, Your Honor. We have books.

15 DIRECT EXAMINATION

16 BY MS. RHEE:

17 Q Professor Milgrom, if I could have you just hold --
18 just so that everybody can hear you because I know you don't
19 always speak the loudest.

20 A Okay. I'll try to speak up.

21 Q Okay. Thank you.

22 MS. RHEE: And, Your Honor, very excited to do a
23 non-housekeeping examination this morning.

24 BY MS. RHEE:

25 Q Professor Milgrom, could you please introduce yourself

1 to the Court, and spell your name for the court reporter.

2 A Yes. I'm Paul Robert Milgrom. P-A-U-L. R-O-B-E-R-T.
3 M-I-L-G-R-O-M.

4 Q And Professor Milgrom, where do you currently work?

5 A I'm a professor of economics at Stanford University,
6 and I'm the chairman of Auctionomics.

7 Q Now, in your capacity as a professor in the economics
8 department at Stanford University, do you teach both
9 undergraduate and graduate students?

10 A Yes, I do.

11 Q And do you advise Ph.D. candidates with respect to
12 their dissertations?

13 A Yes. I have about five graduating this year, yes.

14 Q Do you conduct research yourself?

15 A I do, yes.

16 Q And Professor Milgrom, did you prepare the
17 demonstrative slides for use in connection with your
18 testimony today?

19 A Yes, I did.

20 Q Now, if you could please just very briefly walk the
21 Court through your educational background.

22 A Yes. I got my undergraduate degree in mathematics from
23 the University of Michigan. And after a hiatus, I went back
24 to graduate school and got my master's degree in statistics
25 at Stanford and my Ph.D. at the Stanford Graduate School of

1 Business in a field that was called decision sciences.

2 Q Now, prior to taking a faculty appointment at Stanford,
3 did you have previous academic appointments?

4 A I did.

5 Q And what were they, Professor Milgrom?

6 A The immediately previous one was in the Department of
7 Economics and the School of Organization and Management at
8 Yale University. And before that at the Kellogg School at
9 Northwestern University.

10 Q Now, without dating yourself too much, how long have
11 you been teaching at Stanford?

12 A Since 1987. So 37 years.

13 Q And what is your area of academic expertise?

14 A Well, I've worked in a lot of areas in economics. For
15 the last 20 years or so, though, I have primarily worked on
16 auctions and market design.

17 Q Now, what is the field of auctions and market design,
18 Professor Milgrom?

19 A Well, market design emerged about 30 years ago. It's a
20 subfield of economics that emerged together with the rise of
21 the Internet when people became very concerned about how
22 particular rules would affect the performance of
23 marketplaces, and I was one of the founders of that field.
24 And auctions have been studied by economists for a very long
25 time. I wrote my Ph.D. dissertation about auctions. So

1 auctions have been part of my work since the very beginning
2 of my career.

3 Q Now, have you published in the field -- the subfield of
4 economics that you just walked us through of market design?

5 A Yes.

6 Q And approximately how many peer-reviewed publications
7 have you published?

8 A I'm sorry. I don't know the number, how many.

9 Q More than ten, Professor Milgrom?

10 A Certainly more than ten, yes.

11 Q And how often have those publications that you have
12 published in the field of market design been cited by other
13 academics in this field?

14 A Well, I learned last night that the number on Google
15 Scholar is 114,000, or thereabout times that my work has
16 been cited. I think probably not all by academic scholars,
17 but the Google Scholar number was 114,000.

18 Q Now, in the course of your review in this matter, do
19 you know whether or not plaintiffs' expert, Professor Ravi
20 has cited you?

21 A I believe he has, yes.

22 Q And what about plaintiffs' expert Professor Weintraub?

23 A Yes.

24 Q Now, with respect to plaintiffs' expert Abrantes-Metz,
25 to your knowledge, is she an expert in this subfield of

1 market design?

2 A I have not encountered her in the subfield of market
3 design at all.

4 Q Now, have you won any notable awards, Professor
5 Milgrom, in connection with your work in market design?

6 A I've won a lot of awards, yes.

7 Q Instead of walking the Court through all of the awards,
8 is there one that is quite well known just in popular
9 consciousness rather than just academia?

10 A Yes. In 2020 I was the co-recipient of a Nobel Prize
11 in economics for my work. The short citation was for
12 improvements to auction theory and invention of new auction
13 methods.

14 MS. RHEE: At this point in time, we would seek to
15 qualify Professor Milgrom as an expert in economic theory
16 and in auctions and market design.

17 THE COURT: Any objection?

18 MR. VERNON: No objection.

19 THE COURT: All right. He's so qualified.

20 Do you want to move his CV into evidence?

21 MS. RHEE: Yes, Your Honor. And it is labeled in
22 your binder, and we would put it as Milgrom Demonstrative 2.

23 THE COURT: Oh, simply a demonstrative?

24 MS. RHEE: Well, actually, I apologize. We have
25 been -- I apologize. We've marked it as DTX 253.

1 THE COURT: I assume there's no objection?

2 MS. RHEE: I'm sorry. 2536.

3 THE COURT: 2536?

4 MS. RHEE: Yes. Apologies, Your Honor.

5 MR. VERNON: No objection.

6 THE COURT: All right. It's in evidence.

7 (Defense Exhibit Number 2536 admitted into evidence.)

8 MS. RHEE: And apologies for failing to read your
9 handwriting.

10 BY MS. RHEE:

11 Q Okay. Now, Professor Milgrom, you also talked about
12 working for an organization you founded called Auctionomics;
13 is that right?

14 A That's correct, yes.

15 Q What is Auctionomics?

16 A Auctionomics is a firm that provides consulting and
17 software in connection with high-stakes auctions.

18 Q And is the name auction plus economics?

19 A That was the idea, yes.

20 Q Okay. Now, in connection with the work that you've
21 done at and for Auctionomics, do you have personal and
22 direct experience with display advertising?

23 A I do, yes.

24 Q Okay. And have you been advised by companies other
25 than Google in connection with market design related to

1 display advertising?

2 A I think you said advised by. Do you mean did I advise
3 companies other than --

4 Q Yes. I apologize. Thank you for the correction.

5 A Okay. Yes. I've been an advisor at Yahoo in the
6 period like 2007, 2008. And then from 2009 to about 2017, I
7 was an occasional advisor to OpenX, which is another ad
8 exchange.

9 Q And in connection with the advisory work that you did
10 for OpenX, did you co-invent an auction design that was
11 patented by OpenX?

12 A Yes, I did.

13 Q And in addition to the private sector work that you've
14 done, Professor Milgrom, have you advised public sector
15 clients in connection with market design and auction theory?

16 A Yes. In the United States, in the UK, and Australia,
17 in Mexico, in Canada. I've advised governments in
18 connection with market design.

19 Q Now, focusing on the United States, can you tell the
20 Court very briefly what kind of public sector work you've
21 done for the United States federal government?

22 A Yes. Where I was hired directly by the Federal
23 Communications Commission to lead the design work on the --
24 what was called the incentive auction, which was probably
25 the most complicated auction project in history, actually.

1 It involved buying television broadcast rights from a set of
2 broadcasters, reorganizing the remaining broadcast industry
3 in a smaller number of channels, selling the -- dividing the
4 cleared spectrum into mobile broadband licenses and selling
5 those to mobile broadband companies. It was \$30 billion
6 worth of transactions, and I worked on that project from
7 2011 or thereabouts until 2016, something like that.

8 Q Now, Professor Milgrom, in connection with this case,
9 were you retained to analyze and assess the economic effects
10 of Google's online display advertising auction practices
11 that plaintiffs and their experts allege to be
12 anticompetitive?

13 A Yes, I was.

14 Q Okay. And in connection with that assignment, did you
15 perform analysis to reach your conclusions?

16 A Yes, I did.

17 Q Okay. And what kind of documents, if any, did you
18 review in doing your analysis?

19 A There were multiple kinds of documents. Some of them
20 were emails, some of them were experiments, some of them
21 were planning and design documents. A whole variety of
22 documents in that connection.

23 Q And in connection with the documents you reviewed,
24 Professor Milgrom, did you rely or treat all of these
25 different types of documents equally?

1 A Well, no, I did not.

2 Q And why not?

3 A I think that different documents have different
4 strengths and weaknesses.

5 The planning design documents describe what the
6 details are incorrectly of what Google intends to implement
7 in code. The experiments have the usual strengths and
8 weaknesses of experiments. Short-run experiments typically
9 omit the impacts of adjustments that participants have when
10 rules are changed. And so in looking at experimental
11 documents, I tried to give them appropriate weight.

12 The emails reflect sometimes the perceptions of
13 how the different programs operate and where no data is
14 available to explain what the participants think is going
15 on, and, you know, I just tried to use each document
16 appropriately for what it contained.

17 Q Now, what, if any, empirical analyses did you conduct,
18 Professor Milgrom, using Google's auction data that was made
19 available to you?

20 A Well, I used the auction data that was available. The
21 auction data that's available is more recent than the
22 periods here. But I used it to determine something about
23 the kinds of values that different bidders would have for
24 online advertising, the amount of variation among them,
25 which determines how important matching is, variations

1 across publishers, how differently different publishers were
2 affected in different degrees by the various programs, and I
3 wanted to account for that.

4 So I did that kind of analysis. And then I used
5 the information I learned from that to conduct a variety of
6 simulations to do counter-factuals and try to anticipate to
7 break down effects into their component parts.

8 Q And in conducting your simulations, Professor Milgrom,
9 did you use a standard auction model or some other form of
10 auction model?

11 A No. The simulations were done, and the theoretical
12 analyses, too, in using standard auction models.

13 Q And did you reach your conclusions taking into account
14 all of these various methodological steps that you've just
15 walked the Court through?

16 A Yes, I did, yes.

17 Q Now, I want to direct your attention just in terms of
18 the scope of your opinions and testimony today by showing
19 you Professor Robin Lee's report. And I think the Court is
20 well familiar with this. From Professor Lee's report,
21 paragraph 12, subsection 3 here.

22 Do you see that?

23 A I do see it, yes.

24 Q Okay. And are you familiar with Professor Lee's, both
25 report and testimony where he lays out the five alleged

1 anticompetitive or exclusionary acts, the conduct at issue
2 here in this case?

3 A I was here for the testimony, and -- yeah, and I read
4 the report earlier. Yes.

5 Q Now, are Items 3 and 4 in the plaintiffs' expert, Robin
6 Lee's, report and testimony, the only ones that pertain to
7 auction design and market design?

8 A Those are the only ones that pertain to the things that
9 I studied, yes.

10 Q Okay. So turning now to Figure 2 of your own report,
11 Professor Milgrom.

12 MS. RHEE: And if we could just pull that up.

13 And, Your Honor, at this time we would move in
14 DTX 2077, which is just a reproduction of Figure 2 from
15 Professor Milgrom's report.

16 THE COURT: Any objection?

17 MR. VERNON: No objection.

18 THE COURT: It's in.

19 (Defense Exhibit Number 2077 admitted into evidence.)

20 BY MS. RHEE:

21 Q Now, Professor Milgrom, here you prepared, in the
22 course of your work, a timeline of Google's product
23 evolution; is that right?

24 A Yeah. That was a very important thing to do in my
25 work, yes.

1 Q Okay. And why was it such an important thing to do in
2 your work?

3 A Well, when you evaluate auction design or auction
4 programs and processes, you have to put them in context and
5 understand how they work together with what's already
6 available in the market and the capabilities and processes
7 of the existing participants.

8 Q Okay. And just to orient the Court to how you put this
9 timeline together, obviously in the middle is each
10 sequential year at issue in this case; is that right?

11 A These are the years, yes.

12 Q And then on top of that time line, you have boxes in
13 blue, and you have connoted in the blue sell-side; is that
14 right?

15 A Yes. The blue boxes at the top are about changes on
16 the sell-side largely by Google but also sometimes by
17 competitors.

18 Q Okay. And then conversely on the bottom of this
19 timeline, you have boxes in red, and you have the word
20 buy-side.

21 Why is that?

22 A Well, these are things -- changes that took place on
23 the buy-side. For example, Google Ads beginning on AdX or
24 launching various buy-side programs intended to benefit the
25 buyers, the advertisers in this market.

1 Q Now, turning back to Professor Robin Lee, the
2 plaintiffs' expert's allegations with respect to Google's
3 alleged anticompetitive conduct, can you walk us through and
4 let's circle what the specific allegations are as Professor
5 Robin Lee has put forward.

6 So the first is, if you go back, right, a thing
7 that is referred to as first look.

8 A Yes. First look comes with Dynamic Allocation. So
9 that's DoubleClick launches the DoubleClick ad exchange in
10 July 2007.

11 Q Now --

12 MS. RHEE: Oh, thank you, Mr. Spalding. Okay.

13 BY MS. RHEE:

14 Q And then the next allegation put forward by plaintiffs'
15 expert, Robin Lee, is a thing that he refers to as so-called
16 last look; is that right?

17 A Yes.

18 Q And where do you -- oh, is that --

19 A That's the right place, yes.

20 Q Is the red circle in the right place, Professor
21 Milgrom?

22 A It is, indeed. Last look is a result of the
23 combination that when header bidding was introduced in
24 connection with the DFP, they properly referred to --
25 commonly referred to as last look emerged.

1 Q And then finally, what is the last auction design or
2 auction practice that Professor Lee alleges to be
3 anticompetitive or exclusionary?

4 A That's the September 2019, the -- when Google
5 transitioned to a Unified First Price Auction, which
6 included Unified Pricing Rules.

7 Q Okay. And anything beyond 2019, Professor Milgrom?

8 A I have nothing beyond 2019, no.

9 Q Okay. And the three allegations put forward by
10 plaintiffs' expert Robin Lee, here, as you see on your
11 timeline, are those all on the sell-side or on the
12 publisher's side?

13 A They're all on the sell-side, yes.

14 Q And are you aware, or do you see any allegations put
15 forward by Professor Robin Lee with respect to advertiser
16 side enhancements for innovation?

17 A They weren't in that list, no.

18 Q Okay. So just kind of doing an X-out exercise, does
19 Professor Lee, plaintiffs' expert, make any allegations with
20 respect to whether Project Bernanke in and of itself was
21 anticompetitive or exclusionary?

22 A No, it wasn't there.

23 MS. RHEE: Okay. So let's put an X there. Okay.

24 BY MS. RHEE:

25 Q Similarly right next to it, are there any allegations

1 by plaintiffs' expert, Robin Lee, with respect to buy-side
2 DRS?

3 A I didn't see any, no.

4 Q What about Project Bell?

5 A No.

6 Q What about Project Poirot in and of itself as being
7 allegedly anticompetitive or exclusionary?

8 A No, I did not see that, no.

9 Q And what about Alchemist, which I don't even know if
10 the Court has ever heard?

11 A Right. That was -- no, that was not separately
12 considered. Although it was important to think about in
13 connection with Unified Pricing Rules.

14 Q Okay. And then even on the sell-side, Professor
15 Milgrom, does Professor Robin Lee, plaintiffs' expert, make
16 any allegations of anticompetitive or exclusionary conduct
17 with respect to enhanced Dynamic Allocation?

18 A I don't believe so, no.

19 Q Okay. Now, what about Dynamic Revenue Share on the
20 sell-side, are there any allegations that that, in and of
21 itself, is anticompetitive or exclusionary?

22 A That wasn't in the list -- his list, no.

23 Q Okay. And now what about the launch of Open Bidding?

24 A No.

25 MS. RHEE: Now if we could take that down.

1 BY MS. RHEE:

2 Q In the course of your analysis and assessment,
3 Professor Milgrom, did you conclude that plaintiffs' experts
4 each individually and collectively made a series of
5 mistakes?

6 A Yes, I did. Or mistakes and omissions, yes.

7 Q Okay. So what, if any, mistake or omission did the
8 plaintiffs' experts make with respect to the consideration
9 of incentives and behavior for advertisers and publishers?

10 A Yes. Well, it's routine in market design analyses that
11 when you consider rules or changes in rules, you have to
12 account for how the participants will respond to those rules
13 in order to evaluate the effects. And that was barely
14 touched upon at all by any of plaintiffs' experts.

15 Q What, if any, mistakes or omissions did the plaintiffs'
16 experts make with respect to considering the benefits to
17 Google's customers?

18 A Yeah. There's barely a word in any of those -- the
19 plaintiffs' reports about how Google's programs benefited
20 its customers. Its buy-side programs generally benefited
21 its buy-side customers; and its sell-side programs generally
22 benefited its sell-side customers.

23 Q Now, finally, Professor Milgrom, what, if any, mistakes
24 or omissions did the plaintiffs' experts make in
25 consideration of the historical context in the time frame in

1 which the various practices were developed?

2 A Yes. Well, as I said, time frame is very important
3 because it affects what other practices are going on and
4 what capabilities and processes the participants have. And,
5 again, you hardly see a word about that in the other
6 reports. They act as though time played no role in the
7 developments.

8 Q And finally, what mistakes or omissions, if any, do
9 plaintiffs' experts make with respect to consideration and
10 including limitations of the economies of scale?

11 A Yes. Economies of scale are real, but they're not
12 unlimited, and they exaggerate the scale needed to achieve
13 certain benefits, as I discuss in my report.

14 MS. RHEE: Now, Your Honor, apologies just as --
15 this is actually a matter of housekeeping.

16 The plaintiffs -- I'm sorry, Professor Milgrom's
17 demonstrative that he just walked us through with the
18 circles and the Xs, we would like to mark as an exhibit,
19 DTX 2077 at this time.

20 THE COURT: Any objection?

21 MR. VERNON: No objections, Your Honor.

22 THE COURT: All right. It's in. 2077.

23 MS. RHEE: Oh, 2077A. And thank you,
24 Mr. Isaacson. 2077A, Your Honor.

25 THE COURT: Is that because you already have a

1 2077 in?

2 MS. RHEE: Yes, Your Honor.

3 THE COURT: It's not a matter of redaction?

4 MS. RHEE: No, it is not a matter of redactions.

5 THE COURT: All right.

6 MS. RHEE: Thank you.

7 (Defense Exhibit Number 2077A admitted into evidence.)

8 MS. RHEE: So now if we could pull back up the
9 timeline and begin with the very first entry.

10 BY MS. RHEE:

11 Q In July of 2007, you see that, Professor Milgrom?

12 A Yes.

13 Q And that is the first introduction by DoubleClick of a
14 feature called Dynamic Allocation; is that right?

15 A That's right. That's when DoubleClick launched the
16 DoubleClick ad exchange and Dynamic Allocation in its ad
17 server.

18 Q Okay. If you could just make sure to keep your voice
19 up, Professor Milgrom.

20 A Yep, I'm trying. Okay.

21 Q Thank you. Everybody in the courtroom thanks you.
22 Okay.

23 A Yeah.

24 Q How were digital and display ads being sold prior to
25 the introduction by DoubleClick in 2007 of Dynamic

1 Allocation?

2 A Yeah. The history dates back. Online publishers were
3 offline publishers first, and they would often, if you had a
4 magazine for example, you would have an offline magazine and
5 you would have an online edition. And your salespeople,
6 however they were selling ads online, would say, wouldn't
7 you like to also reach the people who visit my publication
8 online. I'll place the same ads -- would you like to place
9 the same or similar ads in the online edition.

10 And they managed to sell a lot of their inventory
11 that way, but there was leftover inventory which came to be
12 called remnant inventory. And the remnant inventory groups
13 of buyers got together, there were what were called ad
14 networks. The ad networks would contract with the
15 publications to buy the remnant, they would agree on
16 contract terms, most commonly some fixed price, I'll pay
17 \$4/1,000 for impressions that I get are satisfactory. And
18 the online publication, if it had unsold ad opportunity
19 would then offer it to the ad network at that price. The ad
20 network would say yes, I'll take that one; or no, I won't
21 take that one, and they would pay \$4/1,000 in the case I
22 described if they did take it, otherwise they would engage
23 in what's called the passback.

24 They would give it back to the publisher who would
25 then offer it to another ad network, which maybe had offered

1 it \$3/1,000. And that process was called the waterfall, and
2 that was the early process for selling ads in online
3 papers -- online publications.

4 Q So now I'm going to show you what plaintiffs marked and
5 introduced as Plaintiffs' Demonstrative AB.

6 Are you familiar with this graphic, Professor
7 Milgrom?

8 A Yes, this looks familiar.

9 Q Okay. And this is a slide that Professor Ravi, at
10 least as one example, used in the government's case in
11 chief; is that right?

12 A This looks like Professor Ravi's slide, I believe, yes.

13 Q Okay. Now, did you prepare a series of slides to
14 correct and walk the Court through the actual evolution that
15 led up to Dynamic Allocation?

16 A Yes, I did.

17 MS. RHEE: Okay. So if we could -- yeah, pin
18 Plaintiffs' Demonstrative AB at the top so the visual is
19 always there.

20 BY MS. RHEE:

21 Q First walk through your series of corrections. All
22 right.

23 Below, is that a depiction of the historic
24 waterfall that you just walked the Court through?

25 A Yes. This is a historic waterfall where the prices --

1 the different often ad networks would be shown that way.

2 Yes.

3 Q Now, you've removed DFP and AdX from your corrected
4 slide.

5 Why did you do that, Professor Milgrom?

6 A Well, I'm trying to show the environment in which those
7 were introduced. So the waterfall existed before DFP and
8 AdX came into existence, and the inefficiencies that are
9 associated with the waterfall cannot be associated with --
10 cannot be correctly associated with the introduction of
11 Google's product.

12 Q Okay. And now you've changed here as well the name of
13 the bidders from things like PubMatic, Index Exchange,
14 Magnite, OpenX to Demand Source A, Demand Source B, C and D.

15 Why did you do that?

16 A Yeah. Well, this was also historic, I thought. At the
17 time that DoubleClick introduced its product, the primary
18 buyers were not the exchanges. The exchanges -- DoubleClick
19 itself was just introducing an exchange, AdX. Exchanges
20 were just at the very beginning at that point, and the
21 buyers included ad networks and some large ad agencies and
22 so on. So I wanted to correct who the participants were at
23 that time to have an accurate historical document.

24 Q And, finally, you removed the little bid paddles above
25 each one of these demand sources.

1 Professor Milgrom, why did you do that?

2 A There was no bidding going on in these processes or
3 even in the early exchanges. Bidding was introduced by
4 DoubleClick. The auction process was introduced by
5 DoubleClick in the -- in AdX, and so there weren't any bids
6 going on there.

7 Q And in these waterfall days when you point out or, in
8 this slide, keep numbers associated with the so-called
9 historical average, Professor Milgrom, what do those numbers
10 actually represent?

11 A Well, for most of -- there was a lot of variation out
12 there. The world is not a uniform place. For most of these
13 guys, these were contract prices. The contract price might
14 be \$1.06, \$1.04, \$1.01, as shown here. But there were
15 other -- there was variations in the contracts.

16 Q And those are contracts between the publishers and the
17 advertising networks or other aggregations?

18 A Yes, that's right.

19 Q Now let's go to the next demonstrative that you
20 prepared.

21 Professor Milgrom, in this next demonstrative, do
22 you show the inefficiencies associated with the waterfall
23 separate and apart from the introduction of Dynamic
24 Allocation?

25 A Yes. This is why -- one of the reasons Dynamic

1 Allocation was so valuable, yes.

2 Q Okay. So if you could walk the Court through where the
3 inefficiencies lie for publishers using this industry
4 standard back then that was the waterfall.

5 A Yes. Certainly.

6 So at the bottom here, I have the waterfall that
7 existed before the introduction, and a publisher who had
8 these contracts would first offer its remnant impression to
9 Demand Source A because Demand Source A had the highest
10 price. If it accepted the impression, it would pay \$1.06.

11 Demand Source A looks internally among the ads
12 that it has available, and I've added on the top the highest
13 values that they had available. So Demand Source A in this
14 case has an ad that's worth \$1 to it based on its
15 relationship with advertisers. Nothing worth \$1.06. So it
16 says no, this is not an ad that's useful to me. Passes it
17 back to the publisher, who then goes on to Demand Source B
18 and finds a similar problem, that Demand Source B doesn't
19 have any ads to place that are worth \$1.04. Its most
20 valuable ad is 99 cents. So it, too, passes it back to the
21 publisher.

22 And, finally, Demand Source C, when it's offered
23 this impression at a price of \$1.01, looks inside and says,
24 yes, I have an advertiser to whom this is worth \$1.25, I'll
25 pay \$1.01, and the -- and the ad is placed with that

1 advertiser.

2 We never get to find out whether there was a
3 higher value at Demand Source D. Any process like the --
4 like the waterfall that proceeds sequentially is always
5 proceeding without complete information. It doesn't really
6 know whether there are more valuable placements of the ad,
7 and when it fails to find them, that leads to
8 inefficiency -- that is an inefficiency in the matching.

9 Q Now, even with respect to Demand Source C that actually
10 wins that particular piece of inventory made available by
11 the publisher, why is that demand source only paying \$1.01
12 for that piece of inventory when there is an advertiser
13 associated with Demand Source C that might value it for
14 \$1.25, Professor Milgrom?

15 A Well, that's the negotiated contract price. There's no
16 competition going on in setting the price for the publisher.
17 Nothing to drive the price up above \$1.01.

18 Q So even without Dynamic Allocation, Professor Milgrom,
19 in your expert opinion, did the waterfall, as you've just
20 walked the Court through here, cause publishers to lose
21 revenue?

22 A Well, they're losing revenue compared to what they
23 could have made both because of the inefficiency and because
24 the competition is not allowed to raise the price within
25 each of these silos.

1 Q Now, based on this analysis that you just walked the
2 Court through, do you agree or disagree with Professor
3 Ravi's expert opinion report and testimony that first look
4 is what caused the inefficiency and loss of revenue for
5 publishers?

6 A No, I do not.

7 Q And why not?

8 A Well, as we've seen, the inefficiency was there
9 already. And first look was actually, you know, a very
10 natural thing to do for an auction-based platform because,
11 unlike the others, DoubleClick didn't have some particular
12 contract price. It says, well, what contract price do you
13 want? Set -- you, the publisher, can set a price floor, and
14 I'll see if I can beat it. And they used competition to do
15 that, and that would be very naturally put in first
16 position.

17 Q So now let's go to your next correction slide, which
18 moves forward in time and introduces the DoubleClick ad
19 server and the DoubleClick ad exchange. And here, this is
20 the time frame before the Google acquisition; is that right,
21 Professor Milgrom?

22 A That's correct, yes.

23 Q Okay. So now in this slide, what is the innovation
24 that DoubleClick is introducing on top of the existing --
25 the already existing waterfall that you walked the Court

1 through?

2 A Well, it's running an auction. So instead of --
3 instead of having a fixed contract price, it has a floor
4 price. That's the price to beat. And then it runs an
5 auction among its advertisers. And as you can see here, the
6 highest bid -- the highest price it has available is \$1.30.
7 The second price it has available is \$1.20. Those are both
8 above the floor. And under the rules used by AdX, then the
9 second highest bid sets the price, so the price is \$1.20.

10 Q So now, what is the significance of the introduction of
11 an auction on top of the waterfall here?

12 A First, it improves the allocation at least among
13 DoubleClick's advertisers. It creates competition among the
14 advertisers so the advertiser with the highest value will be
15 able to win the impression, and it generates a higher price
16 for the -- when the competition is effective, generates a
17 higher price for the publisher.

18 Q So now what kind of auction did the very first
19 DoubleClick exchange, as you've depicted in this
20 demonstrative, run?

21 A It was running a second-price auction.

22 Q And so let's turn to the next demonstrative you
23 prepared for the Court.

24 Now, the Court has heard a lot about a
25 second-price auction, but given your subject matter

1 expertise here, could you explain for the Court, what is the
2 significance of a second-price auction?

3 A Yes. Well, let me begin by explaining the rules again,
4 even though I know the Court has heard this before.

5 Here, we have -- it's a sealed bid auction.

6 Q And just to pause.

7 A By the way -- yeah.

8 Q Just to pause. What does it mean to be a sealed bid
9 auction?

10 A Yeah. The language is not standard around the world.
11 Some people just call this a sealed tender. Some people
12 distinguish auctions, which is based on its Latin root
13 anyway as an ascending process from sealed bid processes.
14 But within economics and within the industry, all of these
15 things are considered to be forms of auctions.

16 Q Okay. And then if you could continue on with the rules
17 of a sealed bid second-price auction.

18 A Yes. So we have here depicted three envelopes. And in
19 this -- on the left, we see that we have bids of \$7 and \$3
20 and \$1, and these -- in a second-price auction, for reasons
21 I will explain in a moment, it's always optimal for a bidder
22 to submit a bid equal to its maximum price.

23 So, in this case, the winner is the highest bidder
24 who has bid \$7, and the second highest price -- the larger
25 of the second highest price on the floor determine the

1 auction price. In this case, the second highest bid is \$3.
2 That's higher than the floor of \$2. And so the box on the
3 right is marked price, it sets the price at \$3. And that's
4 efficient because the \$7 is also the value of the highest
5 bidder and nobody else has a value that high.

6 The other important thing about this second-price
7 auction and the reason for its popularity for so many years
8 is the simplicity of bidding. I mentioned earlier that a
9 bidder always finds it optimal to set its bid equal to its
10 value, which is a really simple way to bid. And the reason
11 here, you can see that if this -- if the winner -- the
12 bidder who has a value of seven were to bid anything else,
13 if it makes a winning bid, it's still going to pay \$3. It
14 can't effect its \$3 price by making a different bid. And if
15 it bids less than \$3, it will lose, that will be worse. So
16 what you want to do if the highest opposing bid is less than
17 your value is you want to make a winning bid, and you do
18 that by bidding truthfully.

19 And if the highest opposing bid is higher than
20 your value, then the only way to win is by paying a price
21 that's higher than your maximum price. And you don't want
22 to do that, so you want to make a bid that loses, and
23 bidding equal to your value will lose and be optimal in that
24 case as well.

25 Bidding your value is the only bid that, in every

1 situation, is always among the optimal bids. And so it's
2 what we called a dominant strategy for the bidders to set
3 their bids equal to their values. And, again, the big
4 benefit of that, which was really important to advertisers
5 at the time, is it made bidding much simpler than in any
6 other auction format.

7 Q Okay. So now you have a comparison here on this slide
8 to a thing called an ascending auction.

9 Can you walk the Court through why, even though it
10 may not be immediately intuitive, the two kinds of auctions
11 end up with the same result?

12 A Yes. I put this here because I've heard the Judge
13 mention on several occasions comparisons to Sotheby's, and
14 here I have a depiction.

15 If you imagine that you had the same sort of sale
16 going on and you had bidders with values of \$7 and \$3 and
17 \$1, and you had competition in an ascending auction, what
18 would happen is the prices would generally rise until they
19 reached a level somewhere around \$3, at which point only one
20 bidder remains active.

21 So the bidder who has the highest maximum price,
22 \$7, would tend to outbid everybody else, and the price would
23 stop at the second highest value around \$3, and so you would
24 get a very similar outcome. The highest bidder wins for a
25 price equal to the second highest value.

1 So the point is that the second-price auction is a
2 sealed-bid auction, which, by design, is intended to
3 duplicate the result that would happen in an ascending
4 auction.

5 Q So, Professor Milgrom, for those of us who are a little
6 slow on the uptake, including me, why not just conduct an
7 ascending auction for ad inventory impressions where an
8 auctioneer effectively just starts offering that impression
9 at \$1, sees how many bidders there are, raises the price to
10 \$2, sees how many bidders are still there, raises the price
11 to \$3, and so on and so forth until there is only one bidder
12 left?

13 A Yes. This is the particular context here. We want to
14 finish this auction in a few tenths of a second. There are
15 communication lags and latencies, possibilities of breakdown
16 along the way if you're trying to communicate very rapidly a
17 series of bids.

18 So this is intended to run very fast and very
19 simply and bring about the same outcome, provided you have a
20 trusted auctioneer to run the process.

21 Q And with respect to what you just walked the Court
22 through where the outcome is effectively the same in both
23 types of auction scenarios and about the optimal or the
24 predominant bidding strategy that advertisers or the bidders
25 here should submit in a second-price auction, is that an

1 area in particular of subject matter expertise for you?

2 A Oh, yes. Yeah. It's right at the core.

3 Q And can you explain to the Court why?

4 A Well, I design auctions. One of the things I've done
5 is create novel auction designs. For example, the auction
6 design I created for the -- for the U.S. government for the
7 incentive auction -- the broadcast incentive auction that I
8 described earlier. But designs that I've created have been
9 used all around the world for specialized auctions and
10 understanding these kinds of things is right at the core of
11 that.

12 THE COURT: All right. Now, I still have a
13 question.

14 Intuitively, the second-price business does not
15 make sense to me.

16 If I am in a sealed bidding situation and I put --
17 \$7 is what I'm willing to pay for this item, you put in a \$3
18 bid, all right, and I win the bid at \$7, why am I not paying
19 the \$7?

20 THE WITNESS: Well, so that's, again, the rule of
21 the auction. But perhaps I can explain it to you by an
22 analogy that might help you.

23 So if you think about Sotheby's, you will -- often
24 bidders won't be present in the room and they'll give
25 instructions to somebody, and you can think about this as

1 being the instructions that you give to your bid
2 representative, say pay up to \$7. And so think of these
3 bids as just being -- and somebody else says pay up to \$3.
4 Then what will happen when the process is run is that the
5 price will rise to about \$3. You can think of this as, you
6 know, just a step back in the process that we have a trusted
7 auctioneer on the left who is going to use these and run an
8 ascending auction on behalf of the seller, and if he's given
9 these instructions, he'll get a price of \$3.

10 THE COURT: I still don't understand that. It
11 doesn't make sense.

12 Because, I mean, from the bidder's standpoint, I
13 was willing to pay \$7. I put that value on that particular
14 item; right? So I'm prepared to pay the 7.

15 THE WITNESS: Yeah. You went into -- if you went
16 into Sotheby's and you were prepared to pay 7 -- you were
17 buying a painting, and you were prepared to pay \$7,000, you
18 might hope to get it for less. You don't start by bidding
19 \$7,000; you bid and you discover that \$3,000 is the -- is
20 all you have to pay. You're very happy about that. And
21 Sotheby's doesn't know that you would have been willing
22 to --

23 THE COURT: I understand that.

24 But then going back to the sealed bid -- because
25 there's no back-and-forth with the sealed bid; right? I

1 don't know what you're going to bid.

2 THE WITNESS: Right.

3 THE COURT: All right. I put in what I am willing
4 to pay.

5 So you're just saying that the rule of the auction
6 is that the second highest bid becomes the price. It's sort
7 of an artificial decision; is that right?

8 THE WITNESS: Yes. And it was invented
9 specifically to -- for the reasons that we're describing
10 here. That is, in 1961, William Vickrey wins a Nobel Prize
11 for this and related work notices that you can construct a
12 rule of the sealed-bid auction that will replicate quickly
13 what would have happened if you had just given instructions
14 to your bidders and let them bid live against each other.

15 THE COURT: So, to some degree, it disadvantages
16 the seller?

17 THE WITNESS: Yes. So --

18 THE COURT: I could have gotten \$7 in that auction
19 because I was willing to pay \$7. So the person who's
20 offering that impression could have gotten 7 if the rules
21 were different. That's really what we're saying.

22 THE WITNESS: No, it's not what I'm saying.

23 THE COURT: Okay.

24 THE WITNESS: Because this is the other thing
25 that's also missing from the other expert reports.

1 If you made a different rule and said that the --
2 you have to pay the amount that you bid --

3 THE COURT: Right.

4 THE WITNESS: -- then you wouldn't have bid \$7,
5 you would have bid something different. You would say, gee,
6 why would I bid \$7, you know, that's my maximum. It's only
7 worth \$7 to me. I can get it for \$7 at the local store.
8 I'm trying to get a bargain here. I'll bid \$5 and see if I
9 can win for that price.

10 THE COURT: Now I understand. Thank you.

11 THE WITNESS: Okay. Sure.

12 MS. RHEE: I should just sit down, Your Honor.

13 THE COURT: Well, I've got to figure this one out.
14 All right.

15 MS. RHEE: Yes. And I think Professor Milgrom
16 will explain some further here, but I just want to make sure
17 that the Court is satisfied for now.

18 THE COURT: I'm satisfied.

19 MS. RHEE: Okay.

20 BY MS. RHEE:

21 Q So now, Professor Milgrom, plaintiffs' experts have
22 said repeatedly on the stand and in their reports that first
23 look provided a peek at the competing bids.

24 As a participant in a second-price auction,
25 does -- do any of these bidders actually benefit from seeing

1 the amounts of the other bids?

2 A Yeah. That's one of the other part of the magic of the
3 second-price auction.

4 It doesn't matter -- it's always -- when your
5 value is \$7, it's always in your interest to bid \$7. And if
6 I knew that that second highest bid was 4 or 6 or 10, would
7 it change that \$7 as my best bid? No. It has no impact on
8 my best bid.

9 It's like -- again, if I can make this analogy for
10 you to help Your Honor. If you're instructing someone to go
11 buy something at an ascending auction on your behalf and
12 it's worth \$7 to you and you were to learn something about
13 what you thought it might be worth to others, would it --
14 would you want to tell your agent that it was worth
15 something different from \$7? You're telling your agent it's
16 worth \$7 and telling them to do the best you can whatever
17 you find out.

18 So, no, there's no advantage at all in the
19 second-price auction to learning what the other bids will
20 be.

21 Q Now, Professor Milgrom, was DoubleClick the only
22 company in the digital and display advertising business to
23 use the second-price auction format?

24 A This became an industry standard. It was used for
25 years by all of the exchanges that set prices using -- well,

1 determined winners and set prices using the second-price
2 auction.

3 MS. RHEE: And now if we could just go back to the
4 last demonstrative showing the introduction of DoubleClick.

5 Thank you.

6 BY MS. RHEE:

7 Q Now, here again, just to orient, this is what it looked
8 like at DoubleClick even before there was a Google
9 acquisition; is that right?

10 A Yes.

11 It's important to note that before the Google
12 acquisition, these were what were called static bids, that
13 is the bidders themselves didn't have access to, for
14 example, cookie information, so they would specify that I am
15 looking for, you know, residents of Virginia in certain ZIP
16 codes who are -- have some other targeting characteristics,
17 and I'm willing to pay \$1.20/1,000 for ads shown to those
18 people. So that's the kind of bids that were used here.

19 And then if this particular impression was someone
20 who lived in the ZIP code and had the other appropriate
21 targeting characteristics, then I would make a bid of \$1.20.
22 Otherwise, I would have hold that bid and would not bid at
23 all, at least from that ad campaign.

24 Q So in the DoubleClick days, even when this auction was
25 run using static bids, here, as you've demonstrated in this

1 slide, how does it benefit the publisher?

2 A Well, it benefits the publisher in this case by getting
3 a higher price. Instead of just getting the floor price,
4 the publisher is getting the second highest bid, which is
5 higher than the floor price in this example.

6 Q And so, instead of getting an expected return of \$1.06,
7 what is the publisher in this auction scenario get instead?

8 A He's getting \$1.20 instead of \$1.06 because \$1.20 is
9 the second highest bid.

10 Q And not to state the obvious, is that beneficial for a
11 publisher because that's an additional 14 cents?

12 A Yeah. I would rather have \$1.20 than \$1.06 for sure.
13 Yes.

14 Q Okay. Now I want to turn your attention to the next
15 demonstrative that you prepared, Professor Milgrom.

16 MS. RHEE: And Mr. Spalding, if we could get your
17 assistance here.

18 BY MS. RHEE:

19 Q Okay. So now this is a scenario where the publisher
20 has increased the floor price; is that right, Professor
21 Milgrom?

22 A Yes. You see in this example the publisher sets the
23 floor price at \$1.25 instead of \$1.06.

24 Q Now, why did you create this corrected slide where
25 publishers increase the floor price in a world of the early

1 Dynamic Allocation?

2 A Yeah. This is all about auctions. It's always optimal
3 in an auction if you have an outside option somewhere else
4 that you can sell your item if the auction fails. You
5 always want to set the floor price to be at least as high --
6 higher than, actually, the -- your outside option.

7 So if you know that you can sell this for \$1.06,
8 you shouldn't offer to sell it for \$1.06 at auction; you
9 should set the minimum price higher than \$1.06. And in this
10 case, I've just arbitrarily put in \$1.25.

11 Q And, again, what happens for the publisher if they
12 increase the floor price and runs it in an auction?

13 A Well, in this example, what happens is the price winds
14 up being higher. The rule of a second-price auction is that
15 if the winning bid -- if the highest bid exceeds the floor
16 price, then the price is set to be the larger of the floor
17 price or the second highest bid.

18 In this particular example, the floor price is
19 higher than the second highest bid, it's \$1.25 compared to
20 \$1.20, and so the price is \$1.25, and the higher floor price
21 benefits the publisher.

22 Q And now let's go to the last corrected demonstrative
23 that you --

24 THE COURT: Let me just ask a question.

25 No one has talked about what happens if there's a

1 tie?

2 THE WITNESS: Okay. Yeah. We haven't talked
3 about ties because they make very little difference,
4 actually.

5 It turns out, auctioneers use a variety of rules.
6 Sometimes they make slight random perturbations. So ties
7 are broken arbitrarily. It's fine to break the tie 50/50,
8 for example. That doesn't have any effect on any of the
9 conclusions.

10 THE COURT: And in a second-price auction, I mean,
11 there would be no second price possibility?

12 THE WITNESS: Yeah. In the second-price auction
13 if I bid \$1.30 and you bid \$1.30, one of us wins at random
14 and we pay \$1.30.

15 THE COURT: Okay. Go ahead.

16 MS. RHEE: Thank you, Your Honor.

17 BY MS. RHEE:

18 Q Now, in this final corrected slide in front of you,
19 Professor Milgrom, what happens in the scenario where the
20 publisher gets a little greedy and sets a floor price at
21 \$1.35?

22 A Yeah. So if the publisher I guess is wrong and sets
23 the price too high, then the item moves into the waterfall
24 and proceeds just according to the waterfall. The -- this
25 is actually quite important here given -- in terms of

1 historical context, so let me emphasize it.

2 This mechanism was designed to fit into the
3 waterfall. That is, it didn't require the publishers to
4 have different kinds of contracts with ad networks, it just
5 said -- you know, it just said instead of having a fixed
6 price for us, just tell us a minimum price and we'll let the
7 auction set the price and it won't upset the rest of the
8 waterfall. So it's backward compatible. And you can
9 continue to render waterfall and avoid unsold inventory in
10 the same way.

11 Q And here in this example that you lay out, Professor
12 Milgrom, if Dynamic Allocation doesn't result in a price
13 above the floor and it goes back to the preexisting
14 waterfall, what is the publisher going to get?

15 A In this case, the publisher's getting \$1.06. It's
16 offered to the next demand source in the waterfall at a
17 price of \$1.06, and the -- that demand source has an ad
18 worth \$1.10, and so that demand source says yes and pays
19 \$1.06.

20 Q Now, Professor Milgrom, when you say why this design at
21 Dynamic Allocation in the DoubleClick years is backwards
22 compatible, why is that important? Who cares if it's
23 backwards compatible?

24 A Everybody cares. If you're trying to sell a new
25 innovation like Dynamic Allocation and you approach a

1 publisher that has existing relationships with a bunch of ad
2 networks and they have existing processes and existing
3 capabilities of perhaps -- you know, of how they can bid and
4 what they can do, you want the changes that are introduced
5 to be minimal for them. You want to provide something that
6 provides value and is easy for them to implement.

7 I think we've heard lots of testimony in the court
8 about how many years -- months and years it takes when
9 processes and software needs to be changed and tested, and
10 having something that slips right in and doesn't require
11 such changes is -- makes it much more acceptable to
12 publishers and easier for DoubleClick to sell.

13 MR. VERNON: Your Honor, we just want to object to
14 police the rule that when Professor Milgrom is on direct, he
15 cannot refer to fact testimony from other witnesses. We
16 believe that rule was applied to our experts. We just ask
17 that it be applied evenly.

18 THE COURT: Well, the whole point of having dual
19 experts is that they're going to be talking back and forth
20 at each other's expertise and conclusions.

21 MR. VERNON: Yes. I was referring to the fact
22 witnesses. I thought Professor Milgrom was referring to
23 fact testimony about how long it took to develop certain
24 things. That's where I'm asking to police the rule.

25 MS. RHEE: And, Your Honor, let me just ask

1 Professor Milgrom for the correction.

2 THE COURT: All right.

3 BY MS. RHEE:

4 Q Professor Milgrom, in your review of contemporaneous
5 documents that you had access to in the course of forming
6 your opinion, did you see contemporaneous documentation from
7 within Google about how long these kinds of software
8 designs, implementations, test and updates took?

9 A I did see that. And I have personal experience with
10 that. I've been -- I'm an auction designer, and it took
11 five years for the FCC to code the auction rules that I
12 created for that. These things are hard to do and to debug
13 and make sure that they run correctly.

14 Q All right. Now, in addition to what you just walked
15 the Court through, did you also see contemporaneous evidence
16 from your review that publishers did, in fact, benefit from
17 Dynamic Allocation and the auction pressure that the
18 introduction of an auction produced?

19 A Oh, yeah. The benefits were huge. On the impressions
20 that DoubleClick purchased, the price -- the prices more
21 than doubled. The price rise I think was 136 percent on
22 average for the impressions that were purchased by
23 DoubleClick compared to the preexisting contract prices.

24 Q So now if we could turn to Tab 3 in the Court's binder,
25 and the courtesy copy for the government.

1 MS. RHEE: And this is DTX 117. And at this point
2 in time, we would seek its admission.

3 THE COURT: Any objection?

4 MR. VERNON: The United States does object on the
5 basis of hearsay with respect to the blog posts from third
6 parties. We don't know how counsel --

7 MS. RHEE: That is not what we're seeking to
8 introduce. It's the white paper that is the attachment that
9 Professor Milgrom reviewed.

10 THE COURT: I'm sorry, 117?

11 MS. RHEE: Yes, Your Honor.

12 MR. VERNON: We have no objections to the white
13 paper.

14 THE COURT: All right. Then it's -- all right.
15 So you're only looking starting at page 115; is that
16 correct?

17 MS. RHEE: Correct, Your Honor.

18 THE COURT: All right. So the first two pages are
19 out. So 117 -- pages 115 through 148, that's what's in as
20 the exhibit.

21 (Defense Exhibit Numbers 117, pages 115 through 148 admitted
22 into evidence.)

23 MS. RHEE: Yes. So if we could go to page 115 of
24 that exhibit, Mr. Spalding. Okay.

25 BY MS. RHEE:

1 Q So now here, Professor Milgrom, is this a white paper
2 from 2010 that you cite and rely on in your report?

3 A Yeah, that's the title that I recall.

4 Q Okay. And now going to the page ending in Bates
5 Number 415 -- oh, I apologize. Going to the page ending
6 in -- yep, 415. Okay. And pulling up the research and
7 conclusion paragraph so we can all actually read it. Okay.

8 And do you see here that this paper from Q1 2010
9 says: "The results of our research demonstrated that the
10 combined effects of auction pressure and a Dynamic
11 Allocation in DoubleClick ad exchange resulted in an average
12 CPM lift of 136 percent compared with fixed upfront
13 pre-negotiated sales of non-guaranteed inventory"?

14 A Yes, that's the number that I was referring to.

15 Q Okay. And if you could translate for the Court what
16 that sentence means. Because there are a lot of words in
17 there.

18 A Yes.

19 We're comparing the results with and without
20 DoubleClick. With and without the Dynamic Allocation
21 rather. And we're finding a more than doubling of the --
22 CPM is cost per 1,000. That is the prices that are paid,
23 compared with a fixed upfront pre-negotiated sales. I think
24 that comparison is just what it says.

25 MS. RHEE: Okay. And then if we could pull out,

1 Mr. Spalding, and go to the next paragraph, and particularly
2 that first line.

3 BY MS. RHEE:

4 Q Professor Milgrom, here was the study conducted using
5 the first generation version of the DoubleClick ad exchange?

6 A Yes. Meaning the one with static bids. That's right.
7 Yes.

8 Q Okay. And then did you review contemporaneous
9 documentation of what the CPM lift was for publishers when
10 there was a 2.0 version? And this is now post the Google
11 acquisition of the ad exchange with real-time bidding.

12 A Yeah. I understand that in this version that we talked
13 about before was 2007 and that Google recoded it to allow
14 live bids, real-time bids in 2009, and there's a higher
15 number that is associated with the lift with real-time bids.

16 Q Okay. So if we could go to Tab 4.

17 MS. RHEE: And this is DTX 80, Your Honor. And we
18 would seek its admission at this time.

19 THE COURT: Any objection?

20 MR. VERNON: No objections, Your Honor.

21 THE COURT: All right. It's in.

22 (Defense Exhibit Number 80 admitted into evidence.)

23 MS. RHEE: And if we could go to the actual paper.
24 And this is the Bates page ending in 22. Yes. Okay. Thank
25 you. And if we could go to the paragraph that has the

1 bolded 188 percent.

2 BY MS. RHEE:

3 Q So here, did you review this publication that talked
4 about the results of our research where publishers generate
5 now 188 percent more revenue?

6 A Yes. Absolutely. It's the same document. Right.

7 MS. RHEE: Okay. And then similarly if we could
8 show at the beginning of this paper, the very first
9 introductory paragraph on the Bates page ending in 322.
10 Okay.

11 So here -- sorry. It's the next paragraph. So if
12 we could have both of those. Okay. Thank you,
13 Mr. Spalding.

14 BY MS. RHEE:

15 Q So now with respect to this publication, is this the
16 follow-on to the initial study that we just discussed that
17 had been conducted using the first generation version of the
18 DoubleClick exchange, but this study is the further analysis
19 to assess the incremental value impact using the second
20 generation version?

21 A Yes. As it says in the second paragraph, in the second
22 version, the big change was that they moved from the static
23 bids, that I described to the Court before, to real-time
24 bids that made use of cookie information, so they had more
25 information about each ad opportunity.

1 Q And just to state the obvious, how does 136 percent of
2 a CPM lift compare to 188 percent?

3 A 188 percent is bigger, and it means that they compared
4 to the pre, before everything. That's almost triple the
5 revenue. Yeah.

6 Q And then, Professor Milgrom, that's talking about the
7 benefit to publishers with the use of Dynamic Allocation.

8 What, if any, benefits were there to advertisers
9 upon the launch of Dynamic Allocation?

10 A Yeah. Well, the advertisers now, instead of bidding on
11 a whole big -- well, I'm sorry. I was just doing live
12 bidding. Shall we start with Version 1, I guess?

13 Q Yes. And then you can also talk about the benefits in
14 Version 2?

15 A I think the big benefits come in Version 2.

16 But in Version 1, the advertisers are able to
17 select the ads that -- or the ad opportunities in which
18 they're most interested this way.

19 So Google's advertisers in particular are getting
20 a look at -- now at a lot of inventory and being able to
21 offer a price for it.

22 And when there's real-time bidding, this is
23 particularly valuable because you can now select the -- more
24 accurately the advertisers who are likely to be interested
25 in your product and bid just on those and get -- and get

1 more efficiency of your ads. For example, if you're trying
2 to get clicks, you can get many more clicks per dollar by
3 just buying the ad opportunities for the most interested
4 users and lots of value for advertisers in that, which is
5 why they're willing to bid so much.

6 Q So now going back to your Milgrom Demonstrative 1.7.

7 MS. RHEE: Thank you, Mr. Spalding. Okay.

8 BY MS. RHEE:

9 Q Now, Professor Milgrom, you're aware that plaintiffs'
10 experts, both in their reports and in their testimony, have
11 said that going first is always an advantage; do you
12 remember that?

13 A Yes, I've heard them say that. Yes.

14 Q Okay. Is that true? Is it always advantageous to go
15 first?

16 A No, it's not true.

17 Q And why is that?

18 A Well, there are both advantages and disadvantages to
19 going first. If you are in first position, you get to look
20 at all of the inventory, and that's an advantage, you get to
21 select the inventory that's of most interest to you.

22 But as you can see in this example and in real
23 life, the prices that you're facing tend to be higher. It's
24 a lot like -- you know, I think if I want to make it feel
25 natural to the Court, it's not all that different from, for

1 example, a closing sale season where the first buyers show
2 up at the beginning of the season can see all the inventory
3 but they pay full price, but the people that show up later
4 in that season see less of the inventory, but at that point
5 the seller wants to clear the inventory, and so it charges
6 lower prices. And so there can be advantages to going late.

7 And this is happening in tenths of a second, but
8 it's the same idea of at the end you set lower prices
9 because you're trying to clear your inventory. And at the
10 beginning, you hold out for a higher price from -- you set a
11 higher minimum price for your buyers because, you know,
12 you're not that -- it's not that important to sell to them.
13 You have lots of other options to get rid of your inventory
14 if the buyers won't pay that.

15 Q And just to be clear, Professor Milgrom, in the way
16 that Dynamic Allocation worked, was the price floor that was
17 set by the publishers to have AdX bidders and participants
18 try to clear, was that the same floor price that was imposed
19 by the publishers on everyone else down the waterfall?

20 A Oh, no. The floor prices that you set for the auction
21 could be and typically were much higher than the prices that
22 would be quoted to the ad networks further down the
23 waterfall.

24 Q And then turning back to the plaintiffs' experts, are
25 you aware of the academic publication, for example by

1 Professor Ravi, that agrees that first look can, indeed, be
2 a disadvantage for a prospective buyer?

3 A Yes. Professor Ravi has a paper where he analyzes
4 exactly that for otherwise equal ad exchanges and finds,
5 indeed, that you set higher prices, sometimes much higher
6 prices, for the first exchange.

7 MS. RHEE: So if we could go to Tab 5. And
8 publish this up on the screen.

9 BY MS. RHEE:

10 Q Is this an academic publication by Professor Ravi and
11 some of this co-authors with respect to auction
12 design/market design?

13 A It is, yes.

14 Q Okay. And you're familiar with this article?

15 A I am, yes.

16 MS. RHEE: Okay. And we would like to admit at
17 this time as a demonstrative this article so that we can
18 talk through it.

19 THE COURT: All right.

20 MR. VERNON: No objections as a demonstrative.

21 MS. RHEE: So going to the page ending in 895, and
22 in particular, Mr. Spalding, if we can go to the very last
23 paragraph. Yep. Thank you so much.

24 BY MS. RHEE:

25 Q Do you see that particular paragraph of Professor

1 Ravi's article blown up in front of you, Professor Milgrom?

2 A Well, I see a few sentences anyway, yeah.

3 Q Okay. So -- whoops. That's not I think the right --
4 all right. Sorry about that.

5 A This is fine.

6 MS. RHEE: If we could blow back up the "in the
7 equilibrium" example one. Thank you.

8 BY MS. RHEE:

9 Q And here Professor Ravi says: "Intuitively if an
10 advertiser switches to Exchange 1 it will face a very high
11 reserve price because the publisher has a high expected
12 revenue from Exchange 2." And then he says: "As discussed
13 in Lemma 2," which is a whole bunch of calculations.

14 A Yeah. I see that. I think the first sentence goes
15 with that as well, as it's really quite important.

16 Can I explain what's going on here?

17 Q Yes. Please explain to the Court.

18 A So Professor Ravi's paper is about competition among
19 exchanges, and what he's looking at here is that Exchange 1,
20 even when it sets a zero price for its services -- and
21 Exchange 1 is first in the waterfall; Exchange 2 is second
22 in the waterfall. And Exchange 1 in first position, even if
23 it sets no fee is unable to attract any customers because
24 the Exchange 2 -- well, because the reserve price that's
25 set, the floor price that the publisher would set for

1 Exchange 1 is so high that the advertisers in Exchange 1 are
2 disadvantaged. And they face a very high reserve price, and
3 he's explaining in this -- in the highlighted sentence why
4 it will face a very high reserve price.

5 It's -- your clothing store on the first day is
6 not discounting any of its clothing because it has a very
7 high expected revenue from the customers who will arrive on
8 later says, and it's not willing to offer any discounts on
9 the first day. That's, roughly speaking, what the second
10 sentence says here.

11 I hope these analogies are helpful to the Court.

12 MS. RHEE: All right. Let's take down Professor
13 Ravi's article.

14 BY MS. RHEE:

15 Q Now, going back to your timeline, Professor Milgrom,
16 we've just concluded talking basically about the first three
17 boxes or so.

18 So I want to now direct your attention moving
19 forward in time to March 2014. And here, you have an entry
20 again on the sell-side for the Google launch of Enhanced
21 Dynamic Allocation; do you see that?

22 A Yeah. That's a new version of Dynamic Allocation with
23 new features, yes.

24 Q Okay. So prior to March of 2014, did publishers direct
25 deals with advertisers compete head to head with indirect

1 demand for a publisher's inventory?

2 A No, they did not.

3 Q Why not?

4 A Well, the direct deals were sold, and the sufficient
5 impressions or sufficient ad opportunities were set aside to
6 fill those direct deals, and only the remnant -- only what
7 was left over after that were offered to the technologies
8 that we've been describing, the ad exchanges and ad networks
9 and so on.

10 Q Were there any inefficiencies based on your subject
11 matter expertise with that kind of process as it existed
12 prior to 2014?

13 A Yes, there were inefficiencies.

14 Q And what were those inefficiencies?

15 A Well, remember, the whole point of this market, the way
16 you create value is effective matching, showing the right
17 ads to the right users. And when you set aside -- when you
18 segment the inventory into two groups, the set-aside part of
19 it for direct and another part of it for competition, you
20 don't have any opportunity to allocate between them in a way
21 that might enhance values.

22 Q So in non-economic speak, did that just leave money on
23 the table for publishers?

24 A It left value on the table, which left money on the
25 table for publishers and advertisers, actually. They

1 both -- the total pie could be grown if you could match
2 better the ad opportunities to the advertisers.

3 Q So did you prepare a demonstrative to help illustrate
4 this for the Court?

5 A Yes.

6 MS. RHEE: Okay. So if we could go to -- thank
7 you very much, Mr. Spalding.

8 BY MS. RHEE:

9 Q Okay. So now here, how did Google's innovation of
10 Enhanced Dynamic Allocation address this inefficiency that
11 you just identified, Professor Milgrom?

12 A Well, in Enhanced Dynamic Allocation, all of the ad
13 opportunities are made available to bidders in the auction
14 to the programmatic advertisers who are selecting the
15 impressions they want. But it's engineered in such a way
16 that the direct deals are guaranteed to be filled
17 eventually. That is, instead of setting aside particular
18 impressions for the direct deals, the direct deals might
19 lose some impressions, but they will win sufficient to
20 fulfill their contracts.

21 Q So I just want to again make sure that we're all
22 following along, Professor Milgrom.

23 So with Enhanced Dynamic Allocation, did it, on an
24 impression-by-impression basis, put direct deal inventory in
25 a head-to-head competition with indirect demand?

1 A Yes.

2 Q Now, why would a publisher want to put an impression
3 that had been set aside to fulfill a direct deal up for
4 auction against indirect demand instead?

5 A Well, because you might be able to fill that direct
6 deal with a different impression, and this might be an
7 impression that's particularly valuable.

8 For example, it could be that somebody has
9 expressed -- a runner has expressed interest in buying
10 shoes, and Nike would like to show an ad to that user. But
11 the -- in the old system, that impression was set aside for
12 a direct deal for a restaurant or some -- or a clothing
13 manufacturer. And Nike says, well, you know, I'll pay you
14 more for that, why don't you fill your direct deal using
15 some different impression that's not from somebody who's
16 trying to buy shoes today.

17 Q And with that Enhanced Dynamic Allocation, would a
18 publisher care on an impression-by-impression basis whether
19 that particular impression went to a direct deal or a
20 remnant demand if you got a higher price?

21 A You would get a higher price provided it didn't prevent
22 you from also fulfilling your direct deals. And that's the
23 engineering that went in here, that Dynamic Allocation was
24 set up to allow competition for every ad opportunity while
25 still filling the direct deals.

1 Q So, Professor Milgrom, again, did you see
2 contemporaneous evidence in your review of the documents and
3 the documentation in this case that publishers benefited
4 from Enhanced Dynamic Allocation?

5 A Yes, I did.

6 MS. RHEE: Okay. Let's go to DTX 405, which is
7 Tab 6 in the binders.

8 THE COURT: Are you moving 405 in?

9 MS. RHEE: Yes, Your Honor.

10 THE COURT: Any objection to 405?

11 MR. VERNON: No objections to the document. I am
12 getting to the point where I'm not sure the relevance of
13 this line of testimony, given what Professor Milgrom
14 indicated when he crossed off the EDA box as not being
15 something that Professor Lee was saying was anticompetitive.

16 MS. RHEE: Your Honor, given that the government's
17 case alleges that direct deals are completely out of this
18 market and cannot be substituted for indirect demand, this
19 is directly relevant.

20 THE COURT: I'm overruling the objection.
21 Exhibit 405 is in.

22 (Defense Exhibit Number 405 admitted into evidence.)

23 BY MS. RHEE:

24 Q Okay. So now here is a document from 2017, and I want
25 to direct your attention in particular to page 3 of this

1 overview of the effects of Dynamic Allocation. All right.

2 Do you see this blowup in front of you, Professor
3 Milgrom?

4 A I do, yes.

5 Q And did you review it in the course of preparing your
6 expert report and opinion?

7 A I did, yeah.

8 Q And here it says: "There is a publisher revenue
9 increase from Enhanced Dynamic Allocation of approximately
10 950K per day, or 347 million ARR."

11 A Per year, annual.

12 Q Annual; right?

13 A Yes.

14 Q And then the document, very helpfully simplifies and
15 says: "That is, the publishers make nearly a million
16 dollars per day in incremental revenue"; is that right?

17 A That's what it says.

18 Q And, again, is that beneficial for publishers?

19 A Sure. I'd like to make an extra million dollars a day.
20 That sounds very nice. Yes.

21 Q Okay. And then finally, the paragraph below those
22 items says: "Beyond this, it pushed the industry in the
23 direction of allowing programmatic auction-based buyers to
24 compete with direct sales"; do you see that?

25 A I do, yes.

1 Q And do you agree with that assessment?

2 A Yeah. On an impression-by-impression basis, they were
3 competing. Yep.

4 Q All right. So now moving ahead in your timeline. If
5 we could go back to that. We are going to go into the end
6 of 2014 and into 2015 and 2016, et cetera, which is the rise
7 of header bidding.

8 A Yes.

9 Q Okay. Now, if you could just very quickly -- because
10 the Court has heard a lot about header bidding -- just
11 remind the Court, what is the innovation that header bidding
12 actually constituted?

13 A Yes. So header bidding was a way to allow non-Google
14 publishers to participate using real-time bids as well. It
15 was an auction -- a bidding before the auction. So what
16 would happen is that -- it was called header bidding because
17 a snippet of computer code would be inserted into the header
18 of a web page, and when that web page was visited by the
19 user, that would issue a call for bids to the header
20 bidders. And then bids would be received before the ad
21 server was called, and then they would inform the floor
22 prices that were used in the AdX auction.

23 Q And what benefits did publishers get from implementing
24 header bidding code on their websites?

25 A Yeah. Well, they got additional competition, which

1 would do two things. Sometimes you would have header
2 bidders who had very high values for a particular
3 impression, and they would offer a high price and possibly
4 win that impression at more than any Google buyer was
5 willing to pay. And other times, the same thing would just
6 result in higher floor prices for Google. This is the price
7 that Google had to beat was raised. That, too, would
8 increase publisher revenue. So publishers got more revenue
9 because of header bidding.

10 Q So now after a publisher chose to insert that header
11 bidding code and run a header bidding auction, could the
12 publisher just accept the winning bid and then render the ad
13 impression and be done with it?

14 MR. VERNON: Objection. Leading.

15 THE COURT: I'm going to sustain the objection.

16 MS. RHEE: Okay.

17 BY MS. RHEE:

18 Q What, if at all, were the options available to a
19 publisher who chose to run a header bidding auction using
20 that code?

21 A Well, the publisher could just take the highest header
22 bidding bid and serve its ad for that impression. Or it
23 could use that as -- in any way to set -- to determine a
24 line item in DFP in the ad server which would set a minimum
25 price for the auction that Google ran.

1 Q Now, to the extent that a publisher chose to insert a
2 line item that was the expression of the header bidding
3 auction, who controlled that decision, Professor Milgrom?

4 A It's the publisher decision. They could decide what to
5 do and what price to set.

6 Q Now, why would a publisher choose, if it went through
7 all the effort of running a header bidding auction in the
8 first place, to go ahead and then insert a line item into
9 DFP in order to run a whole nother auction on top of that?

10 A Well, they would do that in order to get a higher
11 price.

12 Q And, again, who made that decision and who exercised
13 that control?

14 A The publisher would decide whether it wanted to see
15 whether Google could offer a higher price than it desired.

16 Q Okay. So now we're going to show you Plaintiffs'
17 Demonstrative AC. And, again, this was something used in
18 the government's case in chief, including with its experts.

19 Is that familiar to you?

20 A Yes, it is.

21 Q Okay. And did you prepare a series of demonstratives
22 walking through why there may be errors or omissions with
23 respect to these plaintiff demonstratives?

24 A Yeah. Or why it might be misleading, yes.

25 Q Apologies. Thank you. Or misleading.

1 So, again, we've pinned the plaintiffs'
2 demonstrative at the top here so that it will always be
3 visually available as we walk through your corrections;
4 okay?

5 A Okay. Thank you.

6 Q Okay. And in terms of the first correction --

7 MS. RHEE: Mr. Spalding, can you please put a box
8 around the auction component of this. Okay.

9 BY MS. RHEE:

10 Q Now, Professor Milgrom, can you walk the Court through
11 what corrections you made to the Plaintiffs'
12 Demonstrative AC in terms of how an auction actually
13 operates in this scenario?

14 A Yes. Here as -- oh, thank you.

15 In this example, as in others, the plaintiffs have
16 assumed there's only one relevant bid. It's not much of an
17 auction. They have -- they have a single bid that exceeds
18 the price floor. And, consequently, the price that emerges
19 from the auction, if that were the situation, would be equal
20 to the price floor.

21 Here, I've shown the other more frequent sort of
22 situation where there's more than one bid that exceeds the
23 price floor, and we see that the result is that the auction
24 price is strictly higher than the price floor because the
25 price is set by the second highest bid instead of being set

1 by the floor.

2 Q Now, Professor Milgrom, given your expertise in auction
3 design and auction implementation, how probable is it that
4 there are at least two AdX bidders who would bid higher than
5 the price floor?

6 MR. VERNON: Objection. I don't think this is in
7 his report. I'm happy to stand corrected, though.

8 MS. RHEE: It is in his report insofar as he talks
9 about the whole point of auction pressure, and auction
10 pressure is the participant of multiple bidders.

11 MR. VERNON: I don't think Professor Milgrom's
12 report contains any analysis of how probable it would be
13 that there were two bids above the floor which is what
14 they're asking about now.

15 THE COURT: Well, I haven't read the report, so I
16 don't know.

17 In your report, Professor, did you talk about the
18 probability of there being multiple bidders?

19 THE WITNESS: I don't recall, Your Honor.

20 THE COURT: Okay.

21 MS. RHEE: Let me just correct the question then,
22 Your Honor.

23 THE COURT: All right.

24 BY MS. RHEE:

25 Q Given what you know about auction theory, auction

1 design and implementation, what would the expectation be
2 with respect to a second-price auction at this moment in
3 time?

4 MR. VERNON: I think I have the same objection,
5 Your Honor.

6 THE COURT: No. I think the foundation's been
7 laid. Overruled.

8 BY MS. RHEE:

9 Q You may answer the question, Professor Milgrom.

10 A Yes. Well, the answer always depends on the price
11 floor, as we'll see later. If the publisher sets a very
12 high price floor, it may be less likely that there will be
13 multiple bids over the price floor. If the publisher sets a
14 low price floor, then typically there will be many bids.

15 There are many thousands of potential advertisers
16 typically available here. It's quite common for there to
17 be -- if there are any bids above the price floor, it's
18 quite common for there to be multiple bids above the price
19 floor.

20 THE COURT: And, again, this price floor we're
21 talking about results from header bidding that's already
22 occurred.

23 THE WITNESS: True. But it's chosen by the
24 publisher, and the publisher can choose the level of the
25 price floor.

1 THE COURT: So the publisher could choose the
2 highest bid that came in through header bidding or a lower
3 number; correct?

4 THE WITNESS: Or a higher number.

5 THE COURT: Or higher number.

6 THE WITNESS: You'll recall that -- I will remind
7 the Court that I said earlier any time you run an auction,
8 you always want to set the floor price higher than your best
9 outside option, and when header bidding has taken place,
10 that header bid is an outside option. So you'd want to set
11 a price floor higher than that, not lower.

12 BY MS. RHEE:

13 Q And, in fact, did you prepare a slide for this?

14 A Yes.

15 MS. RHEE: Okay. So if we could go to the next
16 demonstrative.

17 BY MS. RHEE:

18 Q Professor Milgrom, again, in response to the Court, who
19 decides what amount to put into the line item that goes to
20 DFP that triggers the ad exchange auction?

21 A This is the publisher's choice.

22 Q Okay. And, again, even though the publisher is running
23 a header bidding auction, does the publisher need to use the
24 actual winning bid amount as the line item that the
25 publisher inputs into DFP?

1 A It doesn't have to do that, no.

2 Q Okay. And, again, can you explain for the Court why in
3 this corrected demonstrative, a rational publisher would
4 insert a line item that exceeds the header winning bid?

5 A Well, if you can get \$1 outside -- before you've done
6 the auction and you might have somebody who's bidding \$1.10
7 in the auction, in cases the only bidder who's bidding
8 higher, you can only do better by raising the floor price.

9 The worst that happens is that you set the floor
10 price too high and you get your outside option of \$1 anyway.
11 And if you set the floor price, as in this case at \$1.08,
12 which is less than the winning bid, then you get \$1.08, so
13 you can benefit, and you can't lose by raising the floor
14 price in a case like this.

15 MS. RHEE: Okay. Moving on, Your Honor, with the
16 Court's nod.

17 BY MS. RHEE:

18 Q Professor Milgrom, in your review of the documentary
19 and contemporaneous record in this case, did you see
20 evidence that publishers did inflate the line items that
21 were entered into DFP to force AdX bidders to bid more in
22 order to win that impression?

23 A I saw evidence that they did and evidence that
24 capabilities to help them do that were being developed.

25 Q Okay. So turning to those capabilities, I want to

1 direct your attention to Tab 7.

2 MS. RHEE: And here would like to move this as a
3 demonstrative to aid the Court.

4 THE COURT: All right.

5 MR. VERNON: It's not being admitted for the
6 truth?

7 THE COURT: Is there an objection?

8 MR. VERNON: I would object if it's being admitted
9 for the truth. If it's a demonstrative, that's fine.

10 MS. RHEE: It's a demonstrative.

11 THE COURT: Yeah.

12 BY MS. RHEE:

13 Q Okay. And here you see something that you reviewed for
14 purposes of your report, bid adjustment tips and tricks for
15 Prebid.

16 A Yes, I did see this. Uh-huh.

17 Q And here you see the first substantive paragraph says:
18 "What are bid adjustments and how to use them"; yes?

19 A Yes.

20 Q Okay. And then it says underneath that: "Bid
21 adjustments is a Prebid feature that automatically alters a
22 bid using a specified formula. It can be set up for each
23 bidder individually or as a global default rule."

24 A Yes. And Prebid is the software that's used for header
25 bidding or is software that can be used for header bidding.

1 So bid adjustments is a feature that you can put into the
2 header or that you can put in with header bidding that
3 alters the bids so that they set higher floor prices for the
4 AdX auction.

5 Q Now, Professor Milgrom, can you make sure to keep the
6 microphone up.

7 A Okay. I'm sorry.

8 Q As we're going on in time, the microphone keeps
9 dropping down.

10 A It seemed to be echoing, and I was trying to find a
11 good position for it. Sorry.

12 Q Okay. Thank you.

13 Now, as you go further on in this document in
14 terms of bid adjustment tips and tricks for Prebid, do you
15 see on the top of page 3 an actual snippet of code that is
16 offered up, and are you aware of what this piece of code
17 actually allows a Prebid user to do?

18 A Yeah. This -- it's very simple. It says that for
19 standard bids, you can take the CPM -- that is the cost per
20 thousand -- and just multiply it by 1.2. And for AppNexus,
21 you can multiply it by 1.1 and have two different amounts of
22 boosting to the bids that become line items in DFP.

23 Q And by running this snippet of code, is a publisher
24 able to make these adjustments for what is inserted as a
25 line item automatically?

1 A Yes.

2 Q Okay. And then further on down on page 3, just above
3 the bottom, is there another snippet of code that is
4 provided --

5 MS. RHEE: And if we could actually show the
6 snippet of code as well, Mr. Spalding. Right. Okay.
7 Great.

8 BY MS. RHEE:

9 Q -- that allows a publisher automatically by inserting
10 this code to increase the Prebid insertion in comparison to
11 GAM?

12 A Yeah. That's -- it shows as -- just what's described
13 in the paragraph what the code says is you take the CPM and
14 you replace it by the CPM times 1.05. Remember, the CPM is
15 the cost per thousand, it's the way bids are expressed. You
16 multiply it by 1.05 before you put it into DFP, and that
17 gives Prebid an edge in bidding against the Google bids.

18 Q Now, why would there be available these snippets of
19 code to serve as built-in features to allow publishers to
20 automatically raise the value of their header bids as an
21 expression of a line item?

22 A This is what a publisher would want to do if it's -- to
23 maximize its expected revenue from the auction, a publisher
24 would always want to set a floor price in that auction
25 that's higher than its best outside option. That's the

1 general principle that I'm repeating over and over again
2 here.

3 Once it's run, header bidding auction, that
4 becomes an outside option. I could just take one of the
5 header bids. And so I should set the floor price for AdX
6 auction higher than that, and this is an example of how you
7 could do that.

8 Q So now turning to another piece of contemporaneous
9 documentation that you reviewed and cited in your report,
10 let's go to Tab 8.

11 MS. RHEE: And this is DTX 578, Your Honor, which
12 we would seek to admit into evidence at this time.

13 THE COURT: Any objection?

14 MR. VERNON: No objections. We would like to make
15 an exception to the comment rule and include the comments,
16 which I think are very important here.

17 MS. RHEE: Your Honor, I think we've all been
18 operating where the comments are not attributable, and, as a
19 result, we've been stripping them.

20 MR. VERNON: I think the comments here are
21 important on cross. I'll say that.

22 MS. RHEE: And, again, given that the government
23 insisted that we also strip the comments from all of the
24 other exhibits, not quite sure why there's going to be an
25 exception in this instance.

1 MR. VERNON: I don't think the government was
2 insisting that.

3 THE COURT: I'm sorry?

4 MR. VERNON: Counsel said the government was
5 insisting that. I think the insistence came from the other
6 side.

7 MS. RHEE: Well, that was the Court's ruling.

8 MR. VERNON: There are some comments in here that
9 are important on cross for where I think this is going.

10 THE COURT: Well, you can bring them out on cross,
11 but at this point that has been our understanding that this
12 would be -- the comments would be removed. So as an exhibit
13 that goes in --

14 MS. RHEE: Yes, Your Honor.

15 THE COURT: -- the comments ought to not be there.

16 MS. RHEE: Yes.

17 MR. VERNON: And I think I understand --

18 MS. RHEE: We would just note for the record, Your
19 Honor, to the extent that we have been abiding by the
20 Court's rulings in all of the cross-examinations during the
21 government's case in chief, we did not avail ourselves of
22 any of the comment bubbles.

23 THE COURT: Well, I'm not going to foreclose
24 cross-examination. Let's wait until we get to that point.
25 All right.

1 So 578 is in, just without the comments.

2 (Defense Exhibit Number 578 admitted into evidence.)

3 MS. RHEE: Thank you, Your Honor.

4 So now if I could direct Mr. Spalding to turn to
5 the bottom of the second page, and first go to the bulleted
6 item.

7 BY MS. RHEE:

8 Q Did you review the following here -- and first of all,
9 is this a PRD, what's referred to as a product requirements
10 document?

11 A Yes, this is a PRD.

12 Q Okay. And with respect to PRDs in terms of the
13 relative value or the weight that you give these kinds of
14 documents, where do they fall?

15 A This is pretty high. It's -- they're planning a --
16 they're planning for the next product, and this is going to
17 influence the design.

18 Q Okay. So now at the bottom --

19 THE COURT: Let me just stop you, though.

20 Professor, when you went over this document, did
21 you pay much attention to the comments? That's been an
22 issue that's been raised. In other words, as you evaluated
23 this, was that part of your evaluation or not?

24 THE WITNESS: I don't recall doing that. I can't
25 tell you for sure.

1 THE COURT: But you focused on the text itself?

2 THE WITNESS: Yes.

3 THE COURT: Okay.

4 BY MS. RHEE:

5 Q Okay. And focusing on the text here, do you see the
6 bolded description is inflated remnant line item bids?

7 A Yes, I see that.

8 Q Okay. And what follows is: "We've anecdotally heard
9 from some publishers that they inflate the value CPM of
10 remnant line items to try and extract more value from AdX
11 since the remnant line item can set the reserve price for
12 AdX 2P bids to make it 'work harder'?"

13 A Absolutely. That's -- well, you've just read it
14 exactly.

15 Q Okay. And in translation, can you help the Court
16 appreciate the significance of that?

17 A Well, this is exactly what I have been talking about.

18 I might add that, you know, we don't have
19 third-party data, so I don't get to see what actually
20 happens to header bids and whether they're actually
21 inflated. There's no evidence -- direct evidence of that.
22 So all I have available is the descriptions of others who
23 have observed the evidence. And so this confirms -- I had
24 determined before I saw this that I worked out as an
25 economist what the incentives were for all the parties.

1 That's a standard part of my analysis. I expected to find
2 this evidence, and I found this. So this was intended to
3 confirm my belief that there would be inflation of the
4 header bids.

5 Q So then in addition to inflation of the header bids as
6 expressed in the line item, the amount selected by the
7 publisher to insert, let's go and pull out and look at the
8 top of this PRD.

9 You see that, Professor Milgrom?

10 A I do, yes.

11 Q It's the tree -- it's a tree. The Court has seen I
12 think the tree before. And here, starting at the top of the
13 tree, it says 100 percent competing queries.

14 What does that represent?

15 A Yeah. These are the queries in which header bids were
16 submitted into the AdX auction and are competing with the
17 AdX bids, all of them.

18 Q Okay. And, again, who controls and decides whether to
19 submit the header bid into DFP to have it compete with an
20 AdX auction?

21 A The publishers do --

22 Q Okay.

23 A -- make that decision.

24 Q So of the times that the publishers chose to put the
25 header bid up against AdX, how many times did the header

1 bidding auction, or at least what the publishers represented
2 in that line item to be the header bidding auction, win in
3 comparison to AdX?

4 A Yeah. It says the first right there on the tree,
5 54 percent. That is the fraction of these queries that were
6 won by header bidding.

7 Q Okay. And then going down that part of the tree, of
8 the 54 percent of the times that header bidding won, what
9 was the percent of that where the AdX floor was higher than
10 the header bidding line item price?

11 A That's 42 percent.

12 Q Okay. And can you explain for the Court what the
13 significance of that percentage is?

14 A Yes. So, remember, I don't know for sure, I don't get
15 to observe directly whether the header bidding line item
16 price is equal to the header bid. So these header bidding
17 line items may already be inflated, but even after they have
18 been inflated, this says 42 percent of the time the floor
19 price was even higher than that among the auctions that
20 header bidding had won.

21 So it means that intuitively, informally it means
22 that a very high floor price was being set for AdX, even
23 higher than the possibility boosted header bidding line item
24 price, and a very large fraction of the time, 42 percent of
25 the time that header bidding won the floor price to AdX was

1 even higher than the header bidding line item price.

2 Q Okay. And then, Professor Milgrom, when you see this
3 tree and the statistics reported out, does that surprise
4 you?

5 A No. This is just the kind of behavior that I expect
6 the publishers to figure out how to set floor prices that
7 maximize or nearly maximize their revenues, and this is the
8 kind of behavior that would be expected.

9 Q And, again, who controls and sets the floor price for
10 AdX?

11 THE COURT: That's been asked a million times.

12 MS. RHEE: Okay.

13 THE WITNESS: Yes. It's -- the floor prices are
14 set by the publisher.

15 MS. RHEE: Okay. And I think we can take this
16 document down.

17 BY MS. RHEE:

18 Q Now, going back to your timeline, Professor Milgrom,
19 we've now talked about here the publisher's decision to
20 engage in so-called last look. So we're past 2014. And the
21 next entry that you have here is the ad exchange shifting
22 from a second- to first-price auction; is that right?

23 A Yeah. That was a very significant thing. Yes.

24 Q Okay. Why was that such a significant thing?

25 A It completely changes the way the industry is going to

1 work. I was advising OpenX at the time, and when I saw --
2 after 2014 when I saw the way header bidding was working, I
3 predicted actually that the whole industry was going to move
4 to first-price auctions.

5 Because second-price auctions are wonderful when
6 they run in isolation, but when you try to combine the
7 clearing price from a second-price auction with anything
8 else, it becomes a terrible mess, and ad exchanges were
9 starting to understand -- I think what's going on here, I
10 certainly -- this is what was happening at OpenX, is they
11 were understanding that the second price that came out of
12 the auction was not a good bid to send in for header
13 bidding. And I'll just stop there.

14 Q So, Professor Milgrom, should advertising bidders
15 submit the same bid into a first-price auction as a
16 second-price auction?

17 A Oh, no. That's what the Judge and I were talking about
18 earlier. The reason you would -- you won't get more revenue
19 from a first-price auction is people are not going to bid
20 the same; they're going to bid very differently.

21 Q So let's go to the Government's Demonstrative AA.

22 You're familiar with this demonstrative that was
23 used in the government's case in chief, including with their
24 expert, Professor Ravi?

25 A Yes, I've seen this before.

1 Q Okay. And did you prepare some demonstratives to
2 correct what you identified as inaccuracies, omissions and
3 misleading statements?

4 A Yes, I did.

5 MS. RHEE: Okay. So let's pin Plaintiffs'
6 Demonstrative AA at the top and then show the first of your
7 corrections.

8 THE WITNESS: Yes.

9 BY MS. RHEE:

10 Q Okay. So now what is missing here with respect to
11 Professor Ravi's depiction of the world when it's still a
12 second-price auction?

13 A Okay. I want to emphasize that the diagram on top, the
14 one that's faded out, and also the one below, the first
15 column is unlabeled, it doesn't say what it is.

16 There are three kinds of numbers that matter here.
17 There's your value or your maximum price if you think about
18 it in terms of an ascending auction. There's your value,
19 there's your bid, and there's the price that's paid. And
20 there's only two kinds of numbers shown in the diagram
21 above.

22 So what I did was I interpreted the left-hand
23 column as being the bidder's value, that is the maximum
24 price they would be willing to pay, and then I entered
25 within the auction a column for the bids, because the bids

1 will depend on the auction rules and they won't be the same
2 in the two auctions.

3 Q And since you and the Court already discussed at some
4 length about the rules of a second-price auction, let's move
5 onto the corrections that you made with respect to the
6 plaintiffs' demonstrative depicting what happens in a
7 first-price auction.

8 A Yes.

9 Q Okay. So what are the corrections you made, and why
10 did you make them, Professor Milgrom?

11 A Well, I added a column actually -- and for both
12 auctions I added a column for bids, again, interpreting the
13 unlabeled left-hand column as being values. And I show that
14 the bids are lower than the values for the first-price
15 auction but not for the second-price auction.

16 The example is special. The bidder in the
17 first-price auction with the value of five bids \$3 and wins
18 the auction, and that turns out to be exactly the same
19 prices in the second-price auction, which is something of a
20 coincidence here. But it's to emphasize if you tweak the
21 numbers a little bit, the price that emerges in a
22 first-price auction could be the same or higher or lower
23 than the price in a second-price auction. There is no --
24 well, the Judge asked me about this earlier. There's no
25 reason to expect that the price in the second-price auction

1 would generally be lower than the price in a first-price
2 auction. And, in this example, I showed them as being the
3 same.

4 Q And now here should we have Mr. Spalding put in that
5 first column the term value or maximum value to label it as
6 you've just testified?

7 A Yeah. It would be good to have the term value above
8 there. That's what I'm assuming -- in the corrected diagram
9 since it was unlabeled above in their two numbers, and I had
10 to give a meaning to it.

11 THE COURT: All right. I think Professor's voice
12 is sounding a little bit tired, and so I think it's a good
13 time for our break. We'll be on break until 11:30.

14 THE WITNESS: Thank you.

15 (A brief recess was taken.)

16 THE COURT: Ms. Rhee.

17 MS. RHEE: Thank you, Your Honor.

18 BY MS. RHEE:

19 Q All right. Professor Milgrom, can you just test out
20 the lapel or where you put the mic now?

21 A Yeah. I'm trying the lapel mic to see if it works.

22 THE WITNESS: Does that work okay?

23 THE COURT: That's fine. Okay.

24 THE WITNESS: Good.

25 BY MS. RHEE:

1 Q Before we left off before the break we were talking
2 about bidding and the difference in bidding into a
3 first-price auction; is that right?

4 A Yes. Yeah. It's much harder to bid into a first-price
5 auction than a second-price auction, yes.

6 Q Okay. You're going to need to speak into that mic.

7 A Let's see if I can raise that a little more. I'll hold
8 it.

9 Q Sorry.

10 A That's all right.

11 Q Because I didn't hear a word that you just said.

12 A It's fine. I'm fine. Okay.

13 Q Now, did you prepare a demonstrative for the Court to
14 talk about what a rational or optimal advertising bidder
15 would do when confronted with the change from a second-price
16 to a first-price auction?

17 A Yes.

18 MS. RHEE: Okay. So, Mr. Spalding, if we could go
19 to Milgrom demonstrative -- oh, thank you so much. This is
20 1.13.

21 BY MS. RHEE:

22 Q Okay. So, Professor Milgrom, can you walk the Court
23 through what you've actually mapped out here?

24 A Sure. This is just the first part of the logic of
25 bidding into a first-price auction.

1 By the way, we haven't talked about the language
2 of first-price auctions. This is a sort of back formation.
3 This is just a standard auction in which the bidder pays
4 what they win, but in the -- after second-price auctions
5 were invented, people began referring to the traditional
6 auctions as first-price auctions to distinguish how the
7 price was set. So just a little history here.

8 So what I have here is a first-price auction and a
9 bidder who has a value of 5. That means the maximum they
10 would pay is 5, or they could buy something similar
11 somewhere else for 5. And they're trying to get a bargain
12 here. And if you were to bid 5 in an auction like this, you
13 could never make any surplus. That is it's worth 5, you pay
14 5, your surplus value is zero, which is just what you would
15 get if you lose the auction. You can't make any money when
16 you bid 5 and your value is 5.

17 On the other hand, what you could do instead is
18 bid 3, leaving you a surplus of 2, that is if you win, you
19 get something worth \$5 and you pay \$3. So what's not on
20 this slide and is -- makes bidding hard in a first-price
21 auction, you know, you don't know how much you have to bid
22 in order to win. You need to assess the competition, say,
23 well, if I bid 3, do I have any chance of winning? How much
24 better would my chance be if I bid 4? How much would I lose
25 if I bid 2? But you're trading off this surplus against

1 your chance of winning.

2 And, of course, when you have lots of auctions for
3 small amounts, which is what's going on on display
4 advertising, you, in principle, would need to bid optimally.
5 You would need to know how the competition varied from
6 impression to impression. It would use a lot more
7 information, a lot more calculation, and bidders make
8 mistakes. That's the reason second-price auctions were so
9 popular, they were easy to bid in. You don't make any
10 mistakes, you just bid your value and the guy with the
11 highest value wins.

12 So first-price auctions have a drawback, and the
13 drawback is they're harder to bid in, and they don't always
14 lead to efficient outcomes. But you're always going to
15 bid -- the point of this demonstrative is you're always
16 going to bid an amount that's less than your actual value,
17 and that's the only way you can make any surplus.

18 Q And here, for a rational advertiser bidding into a
19 first-price auction, is the shaded amount that we're talking
20 about referred to as bid shading?

21 A Yes, it's referred to as bid shading.

22 Q Okay.

23 A Yes.

24 Q And, again, how easy or hard is it for an advertiser to
25 know exactly how much to bid shade in a first-price auction?

1 A Yes. Well, it's hard because it varies from auction to
2 auction. It varies according to how much competition you
3 expect, how many competitors, how strong they are, what they
4 are likely to bid. Bidders who -- I've advised bidders in
5 first-price auctions before, no surprise, I suppose, and we
6 try to assess the probabilities that they'll bid different
7 amounts in order to figure out what the risks and tradeoffs
8 are. And here, since you're bidding in millions or
9 thousands of millions of auctions, each of which might have
10 different answers to that question, it's hard.

11 Q Okay. So going back to the last demonstrative before
12 we did this, looking at the Plaintiffs' Demonstrative AA,
13 now that you've walked the Court through how bidding differs
14 in a first-price auction, what is the mistake that you
15 correct in Plaintiffs' Demonstrative AA?

16 A That the biggest single mistake here is that it
17 conflates -- well, the first column is unlabeled. It seems
18 to conflate bids and values, and that the bids in a
19 first-price auction and the bids in a second-price auction
20 for the same value are not the same. And they -- and they
21 differ by so much that the revenue ranking can be reversed
22 from the intuitive one that the Judge asked about. And why
23 not take the first highest bid, you might think that that
24 would lead to more revenue, but the bid corrections, the bid
25 shading is so large that it can reverse that.

1 Q And so now here in the Plaintiffs' Demonstrative AA,
2 would any rational Bidder A actually bid their true value or
3 the maximum amount that they're willing to pay into a
4 first-price auction as the Plaintiffs' Demonstrative AA sets
5 forth?

6 A No.

7 Q Because at least for that advertiser or that Bidder A,
8 do they end up in exactly the same place as if they had
9 never bid at all?

10 A No. They earn zero no matter what happens if they bid
11 their value.

12 Q So, again, turning to the academic publications by the
13 plaintiffs' experts, starting with Professor Ravi, does
14 Professor Ravi, in his academic work, discuss why a rational
15 advertiser would, in fact, actually bid a shade into a
16 first-price auction?

17 A Yes. He writes that in his work as well.

18 Q Okay. And so let's go back to what's already been
19 admitted as a demonstrative, it's Tab 5 in the binders.
20 Okay.

21 A Yes. Uh-huh.

22 Q And then at the bottom of page 898 going into the top
23 of 899, you see in this Ravi publication a discussion about
24 implications for advertisers?

25 A I do, yes.

1 Q Okay. And it says: "In the past few years, the
2 selling mechanism in RTB market" -- that's the real-time
3 bidding market?

4 A Yes.

5 Q Okay.

6 "Has dramatically changed. First, publishers
7 moved from waterfalling to header bidding, and then
8 exchanges moved from second-price to first-price auctions."

9 Do you agree with that?

10 A Yes, that definitely happened.

11 Q Okay. And then this Ravi publication goes on to say:
12 "This leaves advertisers uncertain about how to adjust their
13 bidding strategies under the new mechanism"; do you see
14 that?

15 A Yes, I agree with that.

16 Q Okay. And then the publication by Ravi goes on to say:
17 "Our results show that advertisers should shade their bids
18 using the same methods as in a standard first-price auction.
19 The degree of shading depends on the number of other
20 advertisers in the market, as well as their distribution of
21 values for the impression."

22 Do you agree with all of that?

23 A I 90 percent agree. It says other advertisers in the
24 market. Really, it's in the auction impression by
25 impression. The distributions of values and the numbers of

1 advertisers, everything varies. That's part of what makes
2 it so hard.

3 Q Okay. But in terms of just the upshot, which is
4 advertisers should shade their bids into a first-price
5 auction, do you agree with that?

6 A Yes. Absolutely. They should be shading their bid in
7 every one of these auctions.

8 Q Okay. So now if we could go to an academic publication
9 by Professor Weintraub, another of the plaintiffs' expert.
10 If we could go to Tab 9.

11 MS. RHEE: Okay. And again, Your Honor, if we
12 could move this in as a demonstrative.

13 THE COURT: Well, you don't move it in.

14 MS. RHEE: If we could show it as a demonstrative.

15 THE COURT: Yes.

16 MS. RHEE: Thank you, Your Honor.

17 BY MS. RHEE:

18 Q Okay. And, Professor Milgrom, are you familiar with
19 this publication that has Professor Weintraub on the list of
20 authors?

21 A Yes, I am.

22 MR. VERNON: Your Honor, the only thing I would
23 say is this does feel a little cumulative. I think we've
24 never disputed that you should bid shade in a first-price
25 auction. I think Professor Ravi talked about that.

1 THE COURT: Is there anything new?

2 MS. RHEE: Yes, Your Honor. Because this gets
3 into a discussion of something that the government
4 emphasized repeatedly, which is the relevance equivalence
5 theorem.

6 THE COURT: All right. Go ahead.

7 BY MS. RHEE:

8 Q All right. So now you're familiar with this
9 publication; yes?

10 A Yes, I am.

11 Q Okay. And here, this study says in the very first
12 paragraph: "We study actual bidding behavior when a new
13 auction format" -- and here that's the first-price
14 auction -- "gets introduced into the marketplace"; do you
15 see that?

16 A Yes, I do.

17 Q Okay. And when you go down to the footnote, and the
18 authors thank AppNexus/Xandr for sharing their data, is your
19 understanding, having read this paper, that this publication
20 is based on actual data that's provided by AppNexus and
21 Xandr in order to inform its conclusions?

22 A Yes, that's my understanding.

23 Q Okay. And then going back to the first paragraph here,
24 does it go on to say: "The increase in price levels" --

25 MS. RHEE: And if we could help underline that.

1 Thank you so much.

2 BY MS. RHEE:

3 Q "The increase in price levels under FPAs" -- that's
4 first-price auctions?

5 A Yes.

6 Q Okay.

7 -- "relative to price levels under SPAs" -- is
8 that second-price auctions?

9 A Yep.

10 Q -- "dissipates over time, reminiscent of the celebrated
11 revenue equivalence theorem."

12 A Yes.

13 Q Okay. We're going to circle back to that sentence in
14 one second.

15 But then it goes on to explain prices then went
16 down as bidders learned to shade their bids; do you see
17 that?

18 A Yes.

19 Q But it shows that the bidders' sophistication impacted
20 their response to the auction format change.

21 A Yep.

22 Q Okay. So let's take all of this in turn.

23 A Great.

24 Q So now what is celebrated -- at least according to
25 Professor Weintraub's words, the celebrated revenue

1 equivalence theorem?

2 A Yes. It says that in a certain standard auction
3 model -- and I'll highlight for the Court one property of
4 this, everybody's bidding optimally. Everybody's figured
5 out what to do, they're making optimal bids. If everybody
6 is bidding optimally in the standard model, then the average
7 price in the first-price auction and the second-price
8 auction are identical.

9 The bid shading is so large that it completely
10 eliminates the difference between taking the highest and
11 second highest bid. And that's a theorem, which means that
12 it's mathematically proved. In that model, no matter how
13 many bidders, no matter the distribution of values, if
14 everybody is bidding optimally for that situation, the
15 average prices are exactly the same.

16 Q Now, in the line of the government's questioning of its
17 experts related to the celebrated revenue equivalence
18 theorem, the government repeatedly referred to it as a
19 theory, not a theorem; is that accurate, Professor Milgrom?

20 A Well, it's a theorem. It is mathematically proved.
21 There's -- the assumptions are stated explicitly, and the
22 conclusion is derived just from logic and mathematics and
23 nothing else.

24 Q Okay. Now, with respect to this theorem, to the extent
25 that a new auction format results at least in a short-term

1 differential between price levels and revenue, why is that?

2 A Yeah. Bidders take some time to learn. This whole
3 paper is about that, that when the rules change, the bidders
4 don't bid optimally right at the beginning. They discover
5 themselves not making very much money, they learn. The rate
6 at which they learn, it tells us depends on their
7 sophistication as is described and their experience.

8 But it says that the increase in price levels
9 under first-price auctions compared to second-price auctions
10 dissipates over time. Eventually, the -- when bidders learn
11 to bid optimally, the difference in average price levels is
12 expected to vanish. The bidding in the first-price auction
13 is expected to decline.

14 Q Now, with respect to that sentence that you just
15 discussed about how quickly bidders adjust varying depending
16 on their level of sophistication, what impact then does any
17 consequence -- actually, let me just try to repeat that
18 question.

19 For less sophisticated advertising bidders,
20 Professor Milgrom, like smaller advertisers, smaller
21 businesses, does learning how to bid in a first-price
22 auction impact them more negatively than the sophisticated
23 bidders out there?

24 A Well, if they don't -- what's really going on in this
25 market, of course, is that the bidders get assistance from

1 demand-side platforms and from others, and tools are built
2 to help them do this. I think the sophisticated bidders
3 take this on first, they use their own analytical methods,
4 they use services that are provided in the market and try to
5 quickly learn how to bid optimally. And the smaller bidders
6 take longer, and they pay too much for their ads. They are
7 paying more than they need to to acquire the ad impressions
8 they get.

9 THE COURT: And the learning process, though, does
10 require access to data; does it not?

11 THE WITNESS: Well, what happens is that the
12 learning process is sped -- the speed of it depends on what
13 data you have.

14 The first thing that happens to you if you were an
15 advertiser is you would see your average prices going up.
16 You'd say, oops, something is wrong here. And you try to
17 figure out what it is. You say, you know, why are my
18 average prices going up. And you can get that just from
19 looking at your own profits. But exactly how to bid
20 optimally requires looking at data.

21 BY MS. RHEE:

22 Q So turning to that, that goes to the very next point in
23 your timeline.

24 MS. RHEE: So if we could go back to the timeline.

25 BY MS. RHEE:

1 Q Okay. And now we finally see the red box which is
2 about the buy-side.

3 And, again, that would be the advertising bidders;
4 yes?

5 A Yes.

6 Q Okay. And so fast-forward to July of 2017, in the
7 course of your review in order to render your opinions, did
8 you study the Google innovation and the launch of Project
9 Poirot?

10 A I did, yes.

11 Q Okay. And was there a companion project called Project
12 Marple for the Google Ads' advertisers?

13 A Yeah. Almost identical. Yes.

14 Q Okay. So now making the connection, what did Google
15 implement here in order to assist their advertisers in
16 making bid judgments in this transition from the
17 second-price to first-price world?

18 A Yes. Well, Poirot actually involves two parts. It's
19 called Poirot because it's named after the Agatha Christie
20 detective, of course.

21 So the -- the exchanges are running their
22 auctions, and you can't always trust what they tell you are
23 the auction rules that they're using. So part of what
24 Poirot does is detect whether the auction is -- a
25 second-price auction is effectively a second-price auction.

1 So what Poirot does is it tries to detect the
2 auction rules and then to optimize the bids according to the
3 rules that are actually being used by the exchange.

4 Q Okay. So let's turn to Tab 10 of the binders.

5 MS. RHEE: And this is DTX 615. I believe it's
6 already admitted into evidence, Your Honor.

7 THE COURT: All right. If it isn't, is there any
8 objection to it?

9 MR. VERNON: No objection.

10 Can you repeat the tab, though?

11 MS. RHEE: I'm sorry. Tab 10.

12 BY MS. RHEE:

13 Q Okay. And the slide here title is about bidding; yes?

14 A Yes, it is.

15 MS. RHEE: Okay. So let's turn to the page ending
16 in 635. And if we could blow that up.

17 BY MS. RHEE:

18 Q And you're familiar with this slide summarizing the
19 results of experiments done to measure the effect of Project
20 Poirot?

21 A Yes, I am.

22 Q And the slide is titled "Call It Second Price But Run
23 It Like A First Price"?

24 A Yeah.

25 Q Can you explain for the Court what this slide is

1 summarizing?

2 A Yes. Well, that title is about attempts to mislead
3 bidders. So if you don't want bidders to learn to shade
4 their bids. If you switch to a first-price auction and you
5 bid 10, if when you bid 10 and pay 10, it doesn't take you
6 long to figure out that you're bidding in a first-price
7 auction. You're supposed to be paying the second bid, and
8 you're actually paying your own.

9 But if the change you make instead is to -- and
10 I'm going to make up a word here -- a one-and-a-half-price
11 auction, if what you do instead is you charge them let's say
12 the average of their price and the second highest price,
13 their bid and the second highest bid, that will raise price,
14 but it will make it a lot harder to tell from any individual
15 bid. You've bid 10, the second highest bid was 6, you paid
16 8. For all you know, the second highest bid was 8.

17 So these dirty auctions are auctions that there's
18 evidence that the -- well, I was familiar with evidence
19 before this case that the -- that some of the auctions that
20 claimed to be second-price auctions were not actually
21 second-price auctions. And what Poirot did is it detected
22 that systematically, auctions that deviated -- shall I
23 describe how?

24 Q Let me just follow up with something that you said for
25 the Court.

1 You said I was aware of this phenomenon before
2 this case. And why is that, Professor Milgrom?

3 A Well, from several things. I was aware from my
4 discussions at OpenX with people that they didn't believe
5 that all the auctions were actually second-price auctions,
6 and they were wondering whether they were -- whether they
7 should be.

8 And there was also academic work being done where
9 people were doing something very similar to what Poirot
10 does, actually, in trying to detect from statistical data
11 whether the bids they were observing were actually -- or the
12 auctions they were observing were actually second-price
13 auctions.

14 Q And, again, from the advertiser's vantage point, why is
15 a dirty auction harmful for the advertiser?

16 A Well, if they're fooled, if they think it's a
17 second-price auction and bid their value, they wind up
18 paying too much. Their cost per impression goes up, and
19 it's higher than it needs to be compared to optimal bidding.

20 Q And, again, in terms of then what surplus they have in
21 order to continue with advertising campaigns and to buy
22 additional impressions, where does that leave the
23 advertiser?

24 A Yeah. The advertiser, if they have a fixed budget, as
25 many do, they end up buying fewer impressions and they spend

1 less on other exchanges.

2 Q Okay. So let's now direct your attention to the page
3 ending in 636. Okay.

4 And can you walk the Court through what the
5 innovation here is in terms of what Project Poirot does to
6 address this potential for advertisers being misled and
7 bidding less optimally than they should?

8 A Yeah. I'd like to emphasize that they described this
9 as an algorithmic framework. Really, this is an
10 experimental framework. What they're doing is they run
11 experiments, they -- to detect whether the prices they're
12 seeing are consistent with a second-price auction.

13 If I'm in a second-price auction and I randomize
14 my bids whenever the -- whenever the price is -- whenever
15 the second bid is less than \$10 and I'm bidding \$10 or more,
16 I should always be paying the same price, and by running a
17 controlled experiment, I can see that if my prices go up
18 when I bid more must not be a second-price auction in that
19 case.

20 So they are running the detection that they used,
21 actually, is -- in the initial version of Poirot is they bid
22 value in 90 percent, in 80 percent, in 70 percent and
23 60 percent of value, and they checked whether bidding value
24 was close to maximizing their profits. And if the answer
25 was yes, then they treated it like a second-price auction

1 and set bids equal to the value.

2 And if the answer was no, then they used the
3 experimental results to figure out how much shading led to
4 the highest profits, and they bid that way on the next day.
5 This was done using seven days of data, then you bid the
6 next day based on your results from the previous seven days,
7 and you continued to conduct experiments every day so that
8 if the auction rules changed, you would pick that up pretty
9 quickly and adjust your bids accordingly.

10 Q And now based on your review, Professor Milgrom, did
11 what you just walked the Court through run on all of the
12 exchanges that DV360 was bidding into?

13 A Yeah, eventually. It took -- I think the -- including
14 AdX after September. The thing was introduced in July, and
15 by September it was running on every exchange.

16 Q Okay. And did it -- did Google actually conduct the
17 experimentation that you walked the Court through equally
18 across all of the exchanges that you are just describing?

19 A That's my understanding, yes. Equally on all.

20 Q Okay. So now let's go to the slide ending in 644.

21 A Yes.

22 Q Okay. And are you familiar with this launch impact
23 summary slide?

24 A Yeah. I've seen this. Yes.

25 Q Okay. And so let's start with the advertiser impact.

1 And so since the Court is now familiar with
2 surplus because you've been talking about it some, what does
3 it mean here for the advertiser impact to have a 6 percent
4 surplus increase?

5 A Yeah. That means the difference between their value
6 and the prices they paid were as a result of Poirot went up
7 by 6 percent. And you can see the cost -- the costs went
8 up -- sorry. This is CPD. I'm sorry. I forget.

9 Q I'm sorry. You're looking at the 7 percent conversions
10 per dollar?

11 A Conversions per dollar.

12 Q Could you explain to the Court what that is from the
13 advertiser perspective?

14 A Yeah. So the -- so the advertiser is trying to get
15 conversions, and it -- for each dollar spent in advertising,
16 this is a measure of the effectiveness of the spend on each
17 particular exchange.

18 Advertisers were constantly monitoring where they
19 could get the most bang per buck, the most impressions or
20 clicks or conversions per dollar spent, and Poirot increased
21 their conversions per dollar.

22 Q So now here in terms of the exchange impact, what does
23 it mean with respect to the first bullet that overall it was
24 spend neutral?

25 A So overall what has happened is the advertisers are

1 spending about the same amount of money as if they have
2 fixed advertising budgets, so the total spend is unaffected.

3 Q And in terms of just the allocation of that spend, is
4 that where the dirty auctions the spend drops and then it's
5 picked up by the second-price auctions?

6 A Yes.

7 If I may remark, these are short-term experiments
8 regarding the overall spend neutral. What one would expect
9 in the short run is that you'd just spend your budgets in
10 any case and review them. One would expect over the longer
11 term that, of course, this wouldn't be spend neutral, that
12 if you're resulting in better performance for your
13 advertisers, they would increase the spending on these
14 exchanges to the extent that they could -- well, their
15 dollars had become more effective spent on these exchanges.

16 Q Thank you for that clarification, Professor Milgrom.

17 Now, finally, you see the last bullet point where
18 very few customers, less than 1 percent, opted out.

19 Does that surprise you given your auction
20 expertise?

21 A Well, this is really hard for customers to deal with.
22 This is a service that Google's offering. It says we'll
23 figure out for you which exchanges you need to adjust your
24 bids, and we'll adjust your bids to maximize profits, and
25 this is -- and customers said, well, that was really hard,

1 I'll let Google do that for me.

2 Yes, very few customers opted out.

3 Q Now, based upon your review of the documentation, did
4 Google charge for either Project Poirot, for DV360
5 customers, or Project Marple for Google Ads customers?

6 A My understanding is that those were free. They were
7 included services.

8 Q And now based on your review, did you see evidence that
9 competitors, DSPs for advertisers, also developed some form
10 of bid shading support or assistance like Poirot?

11 A Yes, I did see that.

12 Q Okay. And for those competing DSP bid shading
13 offerings, did you see evidence that at least some
14 competitors charged for that service?

15 A Yeah. I remember seeing such evidence, yes.

16 Q Now, finally, Professor Milgrom, you've heard
17 plaintiffs' experts opine in this case that Poirot was
18 pretextual and its actual purpose was to damage header
19 bidding; do you agree?

20 A I think that's ridiculous. I'm sorry.

21 Q And why do you disagree?

22 A I mean, it's just the obvious thing that if you are
23 serving advertisers and providing technology to help them to
24 bid, this is the obvious thing to do. Everybody would do it
25 if they were -- any good business person would do that.

1 Q Okay. And if we could just try to make sure you keep
2 your voice up.

3 A Okay.

4 Q I know we've been going a little while.

5 A Okay.

6 Q So moving on in the march of time, let's go back to
7 your timeline.

8 And here now we're going to talk about the Google
9 launch of Open Bidding.

10 A Okay.

11 Q Because header bidding, it doesn't go away; does it?

12 A No. It brings in more real-time bids. It's a good
13 idea.

14 MS. RHEE: Okay. So if we could please move to
15 admit and show DTX 2085, which is a figure from your report.

16 THE COURT: Are you moving it in?

17 MS. RHEE: Yes. 2085, which is Tab 12.

18 THE COURT: Any objection?

19 MR. VERNON: No objections, Your Honor.

20 THE COURT: All right. It's in.

21 (Defense Exhibit Number 2085 admitted into evidence.)

22 MS. RHEE: Okay. And if we could get -- thank
23 you, Mr. Spalding.

24 BY MS. RHEE:

25 Q All right. Now you see here this is a figure that you

1 put in your report which is external data from EMARKETER?

2 A That's right.

3 Q Okay. And is EMARKETER a third-party publication
4 that's commonly used in this industry?

5 A That's my understanding, yes.

6 Q Okay. And then here where we place Open Bidding is in
7 2018; is that right?

8 A Where did we place Open Bidding exactly on that
9 previous slide?

10 Q Okay. Yes. Okay.

11 MS. RHEE: Mr. Spalding, if we could actually get
12 you to help us put that marker for the launch of Open
13 Bidding in 2018.

14 THE WITNESS: There it is. Okay.

15 BY MS. RHEE:

16 Q And this is April of 2018.

17 A Yeah. The testing began earlier. That's what I'm
18 thinking. Okay. Yes. Thank you.

19 MS. RHEE: So if we could go to the header bidding
20 adoption figure and --

21 THE WITNESS: April 2018 now. Yes.

22 MS. RHEE: And show where that is.

23 MR. SPALDING: Open Bidding.

24 MS. RHEE: Yes. So let's go to the header bidding
25 slide. Yes, that one that you had just pulled up. Okay.

1 And blow that up. And put a line -- a red line in April of
2 2018. Okay. Terrific.

3 THE WITNESS: Good.

4 BY MS. RHEE:

5 Q Professor Milgrom, are you with me while we were doing
6 some technical catch-up here?

7 A I'm still with you, yes.

8 Q Okay. And so here, are you aware of the plaintiffs'
9 experts contention that header bidding was negatively
10 impacted by the introduction of Open Bidding?

11 A I've heard that alleged, yes.

12 Q Okay. And do you agree with that allegation?

13 A Well, the evidence I'm looking at, which is what I
14 relied on in my report, shows that the adoption of header
15 bidding continued, it increased after Open Bidding, and by
16 the close of this, it's almost 80 percent of the market, so
17 it doesn't look like it's been harmed at all.

18 MS. RHEE: Okay. And at this point in time, Your
19 Honor, if we could move in DTX 2085A with that red line.

20 THE COURT: Any objections?

21 MR. VERNON: No objection, Your Honor.

22 THE COURT: Okay. It's in.

23 (Defense Exhibit Number 2085A admitted into evidence.)

24 BY MS. RHEE:

25 Q Now, for a publisher who was amongst this 70 to

1 80 percent who adopted header bidding, if the publisher
2 tried to run the header bidding auction itself, were there
3 costs and work that was associated with that?

4 A Oh, yes. For sure. Yeah.

5 Q Okay. And what, if any, latency issues existed for a
6 publisher who tried to adopt header bidding and run it on
7 its own?

8 A Yeah. Well, header bidding comes in two versions,
9 actually. On those side -- header bidding as initially
10 introduced ran from the web page and the consumer's
11 connection could vary. There could be significant latency
12 added by the communication between the user's computer and
13 everybody else. So it was slower than server-side header
14 bidding, yeah.

15 Q Okay. And the server side is basically what happens in
16 the early days when it was just code and it was run on the
17 website?

18 A The server side is what happened later, actually.

19 Q Oh, I apologize. Yes. Thank you, Professor Milgrom.

20 So this is client side that you're talking about?

21 A This is client side, yeah.

22 Q And then, again, if a publisher were to run its own
23 client-side header bidding auction, what, if any, billing
24 issues would that publisher have to deal with?

25 A Yeah. Well, it has to make sure that it has accurate

1 information about what's happening on the client's side.
2 It's not happening on its own computers. And there were
3 billing disputes and discrepancies that it would have to
4 work out.

5 Q And then, similarly, if a publisher were to run its own
6 client-side version of the header bidding auction, what, if
7 any, difficulties -- technical difficulties would that
8 publisher confront with respect to configuration and
9 administration of that auction?

10 A Well, the -- the information that I've read suggested
11 that the publishers had found it very difficult to
12 configure -- to configure this. I suppose -- I'm not a
13 technical expert in these areas, but there's -- the way the
14 code runs is going to depend on the browser, and it has to
15 do the integrations all for itself, and there are
16 indications in the materials that I've reviewed that it took
17 them a lot of hours to do that.

18 Q Now, at the time that Google was contemplating and
19 developing Open Bidding, in your review of the materials for
20 purposes of your opinion and report, did you see other
21 competitors also developing and launching their own
22 header-bidding solutions like Amazon?

23 A Like Amazon, for example, yes.

24 Q Okay. And then did you review the materials in
25 connection with Prebid?

1 A Yes. In Prebid, that's right. Those are the two that
2 I was aware of.

3 Q All right. Now, Prebid is open source; correct?

4 A Prebid is open source, and, therefore, free, yes.

5 Q Okay. Even though it's free, with that open source
6 code, what, if any, additional work would a publisher have
7 to do in order to take that open source code and actually
8 run a full header bidding auction?

9 A Well, all the things we've just described are involved.
10 It has to -- it has to make sure it works on a whole set of
11 different browsers. And this is sort of beyond my area of
12 expertise that we're asking about here.

13 Q Okay. So now we're going to get to just closing this
14 out.

15 Are you aware that Amazon charged a fee for its
16 header bidding solution?

17 A Yes, I am.

18 Q Okay. And, similarly, are you aware that Google
19 served -- charged a fee for its header bidding solution?

20 A Yeah. For Open Bidding, yes.

21 Q Okay. And with respect to those solutions, did they
22 address as well the billing discrepancies, the technical
23 work and the latency issues that you just walked us through,
24 Professor Milgrom?

25 A Yeah. And a certain amount of support, of course, when

1 you have a technical solution. Somebody to call when
2 there's a problem. Yeah. All of those things were
3 included.

4 Q Okay. So now, finally, moving on in time, let's go to
5 the -- actually, apologies. We don't need to go back to the
6 timeline quite yet.

7 In your review of Google's development of Open
8 Bidding, did you come across difficulties that Google
9 encountered in comparison -- in comparing the outcome of
10 first- and second-price auctions head to head?

11 A Oh, yes. Absolutely.

12 Q And can you explain for the Court what you observed in
13 your review of the materials?

14 A Yes. This is a problem any time for -- in a
15 second-price auction, suppose that you are the bidder and
16 you have a value of \$10 and somebody else has the second
17 highest value of \$6, the clearing price is \$6, and suppose
18 that price of \$6 is then used to represent you in another
19 auction, which is a first-price auction. You know, you
20 might -- your value could have been \$100 or \$1,000 and it's
21 still being represented by a \$6 bid.

22 The price that emerges from the second-price
23 auction is really not suitable to pass, and it's a bid to
24 represent you in a first-price auction, which is why I had
25 predicted to OpenX that what was going to happen as a result

1 of header bidding was people were going to have to switch to
2 first-price auctions so that the bid you made would
3 represent you when it was forwarded from the -- from one
4 auction to the next. This was the auction-of-auctions
5 problem, as I called it. An auction of auctions doesn't
6 work when any of the auctions are second-price auctions.

7 Q Okay. So how easy or hard is it to run an auction of
8 auctions based on what you just said?

9 A Well, you can run it, but it's not going to lead to
10 efficient results. You're not normally going to have -- you
11 don't get to compare the highest bid from the different
12 auctions if only the second highest bids are being
13 forwarded. So you're going to lose matching efficiency, and
14 that typically will involve losses for both -- for both
15 publishers and advertisers.

16 MS. RHEE: Okay. So let's go to DTX 705.

17 THE COURT: Any objection to 705?

18 MS. RHEE: It's already --

19 THE COURT: Is that already in?

20 MS. RHEE: It's Tab 14. I apologize. We're going
21 to seek to move that in, Your Honor.

22 MR. VERNON: No objection, Your Honor.

23 THE COURT: Okay. It's in.

24 (Defense Exhibit Number 705 admitted into evidence.)

25 MS. RHEE: Okay. Let's go to page 7 of this

1 slide.

2 THE WITNESS: Yep.

3 BY MS. RHEE:

4 Q And this is a visual depiction that says the auction is
5 evolving from relative chaos.

6 So in the period that we're talking about, the
7 first launch of Open Bidding before there's a Unified First
8 Price Auction, is that depicted by the left-hand side of
9 this picture?

10 A Yes, this is the period before.

11 Q Okay. And do you agree with the assessment on the
12 slide that that picture depicts chaos?

13 A Yes. It depicts even more than what I was describing.
14 You'll notice it has a second-price auction at the bottom
15 which does integrate nicely, but we also have bids going
16 through various different routes before they get to the
17 Unified First Price Auction.

18 Q Now, insofar as this gets us to that last box in your
19 timeline, Professor Milgrom, which is the launch -- Google's
20 launch of a Unified First Price Auction in September of
21 2019, have you heard the plaintiffs' experts contend, well,
22 Google could have just launched it a lot earlier, the
23 header -- you know, the auction of auctions could and should
24 have just come a lot earlier in time?

25 A Yeah, I've heard them make that allegation.

1 Q Okay. And do you agree with that assessment?

2 A Not at all, no, I don't.

3 Q Okay. And can you explain for the Court why?

4 A Well, as I explained at the beginning, the second-price
5 auction was popular because it was so easy for bidders to
6 bid. When we got to the first-price auction, it was harder.
7 Google started launching methods to do that. The first
8 version of Poirot was a method to do that. That socialized
9 bidders to the idea that they weren't bidding directly, that
10 they were delegating their bidding to Google, and Google
11 improved Project Poirot enormously. They're bidding into
12 first-price auctions once they emerged has become more
13 sophisticated.

14 The idea that you were going to unify first-price
15 auctions, well, we needed -- along the way -- it depends on
16 what date you pick, but along the way there were standards
17 developed for real-time bidding that didn't exist at the
18 very beginning. There were methods for bidding in
19 first-price auctions that hadn't been worked out at the
20 beginning.

21 And then there were these questions of how you
22 were going to get a standard agreed upon by the industry so
23 that everybody would be doing it. That didn't exist, you
24 know, at various points in time. So it took a while to get
25 to the Unified First Price Auction.

1 Q And now in particular from the advertiser's
2 perspective, the Unified First Price Auction got rolled out
3 along with deprecation of last look and unified price
4 floors; correct?

5 A That's right.

6 Q Okay. What was the problem that the Unified Pricing
7 Rules or price floors was meant to address, Professor
8 Milgrom?

9 A Well, it did two things. It simplified the process of
10 setting floors, but it included a restriction that the
11 plaintiffs don't like that it was -- that it required
12 unified -- it said only one floor price for every exchange.
13 And that was intended to deal with the issue of price
14 fishing, which could arise when there were multiple floors.

15 Q So did you prepare a demonstrative to aid the Court to
16 understand what price fishing is from the perspective of an
17 advertiser?

18 A I did, yes.

19 Q Okay. So if we could go to the next demonstrative
20 here. All right.

21 Now, Professor Milgrom, can you walk us through
22 what price fishing is and why it leads to advertisers
23 competing against themselves for the very same impression?

24 A Yes. In this demonstrative, the publisher has an
25 impression that it wishes to offer, and it sends it to each

1 of three exchanges with three different floor prices.

2 The different floor prices can mislead the
3 advertiser. Advertiser sees a floor price of \$3 and may
4 think I can't acquire this impression unless I'm willing to
5 bid at least \$3, or it sees it on Exchange B and doesn't
6 know that it's the same impression. It thinks I can't win
7 this impression unless I bid at least \$2. And the
8 advertiser by charging -- by quoting three different floor
9 prices might succeed in convincing the advertiser I really
10 want this impression. I'll bid \$2.25 when the floor price
11 is \$2, when if he had understood that the floor price of 1
12 was going to be available in Exchange C, he could have
13 acquired the same impression for just \$1.10, or at least
14 would have wanted to bid only \$1.10.

15 Q So now the Court has heard a lot of testimony about the
16 value of being able to do this from the publisher's
17 perspective, but from the advertiser's perspective, is this
18 harmful or beneficial?

19 A Well, it's harmful to advertisers.

20 Q Okay. Why is it harmful for advertisers?

21 A Well, the advertiser is confused here, is unable to
22 optimize its bid. If the advertiser understood these rules
23 or what was happening, it wouldn't be bidding into
24 Exchange B at all here. It would know that the bid it
25 really wanted to make could be -- it's bidded through

1 Exchange C. So there's confusion going on, and it's leading
2 to mistakes. They're paying higher prices, getting lower
3 returns for their advertising dollars.

4 Q And here again, is this for the very same impression to
5 be served up to the very same user?

6 A This is the very same impression, and the advertiser in
7 some of these calls is being misled about the actual floor
8 price. Well, the actual lowest bid that it could make to be
9 included in the auction.

10 Q Now, why do you call this self-competition, at least
11 from the advertiser's perspective?

12 A Well, because the advertiser has submitted a bid of
13 \$1.10, which is the bid it really wants to make, and then it
14 outbids itself by bidding \$2.25 where it's been misled into
15 making a second bid.

16 Q And, again, for the very same impression?

17 A For the very same impression here.

18 Q Okay. And now, Professor Milgrom, in your review of
19 the documents in this case, did you see evidence that
20 suggested publishers actually did this to game the system?

21 A Well, the UPR was introduced at exactly the same time
22 as the first-price auction, so we didn't see exactly this.
23 That is, we didn't see price fishing.

24 We did see what was called multi-calling before
25 that, which is a similar behavior that applied for -- that

1 applied before the -- at an earlier period.

2 Q Okay. So let's go to DTX 298. This is Tab 15 in your
3 binders.

4 THE COURT: Any objection to 298?

5 MR. VERNON: No objections.

6 THE COURT: All right. It's in.

7 (Defense Exhibit Number 298 admitted into evidence.)

8 BY MS. RHEE:

9 Q Okay. So now here is an email that you reviewed and
10 cited in your report. And I want to direct your attention
11 to --

12 MS. RHEE: Whoops, no. We're going to go -- keep
13 on the first page here.

14 BY MS. RHEE:

15 Q And it is an email dated January of 2016 where
16 Mr. Bellack says: "I realized last week pubs can still play
17 soft floor games even with HB" -- is that header bidding?

18 A Yes.

19 Q -- "or Jedi." And is that Open Bidding?

20 A Yes.

21 Q "They could still put different floors on different
22 exchanges, calling them in parallel"; do you see that?

23 A Yes.

24 Q And is that sentence consistent with what you were just
25 walking the Court through?

1 A Yeah. And I was making the analogy to the same problem
2 that I had described earlier as multi-calling, yeah.

3 MS. RHEE: All right. If we could take that down.

4 BY MS. RHEE:

5 Q Now, Professor Milgrom, in your review of the
6 materials, did Google ever introduce UPR at a moment in time
7 without the Unified First Price Auction, or did they happen
8 at the same time?

9 A My understanding is this happened at the same time. It
10 was a package.

11 Q Okay. And from your vantage point as an auction
12 expert, why is it significant, if at all, that UPR got
13 rolled out at the same time and along with the Unified First
14 Price Auction?

15 A Well, before the Unified First Price Auction, if people
16 are running different auction rules, it's appropriate -- or
17 if they're running a waterfall, as we've described, it's
18 appropriate to have different floor prices. And the
19 waterfall I've already described to the Court. How you want
20 to set a higher price for the first exchange in the
21 waterfall and those fall throughout.

22 And when we moved into Open Bidding and had a mix
23 of second-price auctions and first-price auctions, floors
24 operate differently in a second-price auction. The floor
25 can become the price, and in a first-price auction it

1 cannot. So different floors and different auctions made
2 sense.

3 But when Google moved to the Unified First Price
4 Auction, those reasons -- those benefits of setting
5 different floors for different exchanges were gone. But the
6 risks of setting different floors for different exchanges
7 remained, and the cost/benefit tradeoff shifted. It made
8 sense -- Google decided it made sense to have a Unified
9 First Price Auction then.

10 Q Okay. I just want to make sure that we're all
11 following along.

12 Professor Milgrom, what, if any, incentives change
13 for a publisher who might want to set different price floors
14 in a second-price world versus a Unified First Price
15 Auction?

16 A Well, in doing the calculations for each, in a
17 second-price auction, if you raise the floor price and there
18 is only a one bidder above the floor price, then you raise
19 the price that the bidder pays.

20 In a first-price auction, if you raise the floor
21 price and there's only one bidder above the floor price or
22 any number of bidders, it has no effect on the price that's
23 paid. Floor prices play different roles in a first-price
24 auction and a second-price auction. So the reasons to set
25 any particular floor price are just not the same in the two

1 kinds of auctions.

2 Q And is that why you just testified to the Court the
3 significance of Google rolling out the change to Unified
4 Pricing Rules at the same time and only at the same time
5 that it moved to a Unified First Price Auction?

6 A That's why I emphasized that, yes.

7 Q Now, finally, just based on your subject matter
8 expertise and your review of the record here, even after the
9 Google move from second-price to a Unified First Price
10 Auction and the imposition of Uniform Pricing Rules, did
11 publishers still have the wherewithal to prefer a certain
12 exchange over another or to discriminate against a certain
13 exchange over another?

14 A Yes, they did.

15 Q Okay. And what were the other tools or levers
16 available to publishers who, for whatever reason, might
17 still want to prefer an exchange or discriminate against an
18 exchange?

19 A Well, there were many, actually, quite common ones in
20 auctions around the world. One of them is by deciding who
21 could participate in each auction. You could exclude, if
22 you wished, an exchange from an auction just through the --
23 through the ad server through DFP or GAM.

24 Another way is that you could offer -- you could
25 offer post auction discounts. It's quite common to say if

1 you want to favor a bidder, you say, well, if you win for a
2 price of \$1, you only have to pay 85 cents. That would
3 encourage the bidder to bid more.

4 MR. VERNON: Objection. I think this answer and
5 the last answer were not in his report.

6 MS. RHEE: Your Honor, this is directly responsive
7 to Dr. Abrantes-Metz's testimony.

8 MR. VERNON: That doesn't mean it's in the report,
9 though.

10 THE COURT: Was this in your report, this
11 discussion?

12 MS. RHEE: Yes, Your Honor.

13 THE WITNESS: I discussed some of these things in
14 the report, yes.

15 MS. RHEE: Yes. And I would refer the Court to
16 paragraph 464 in Professor Milgrom's report.

17 THE COURT: All right. Hold on.

18 MS. RHEE: And that is where he states that even
19 after UPR was introduced, publishers could still divert some
20 of the revenue or the number of impressions to header
21 bidding exchanges, and then there are citations to --

22 MR. VERNON: Your Honor, that paragraph is about
23 bid inflation or inflating the value of CPM, which we talked
24 about before, and which I didn't object to. But turning an
25 exchange off or providing a discount on either of those

1 things, that's why I object to those questions.

2 THE WITNESS: Well, I did say in the last sentence
3 publishers could choose to offer some impressions only to
4 their preferred exchanges.

5 THE COURT: I'm overruling the objection. It's
6 within the scope.

7 BY MS. RHEE:

8 Q So continuing on, Professor Milgrom, are you familiar
9 with Dr. Abrantes-Metz's testimony and report that UPR was
10 anti-publisher because it "restricted publisher choice"?

11 A Yes.

12 Q Okay. And do you agree with that contention?

13 A No.

14 Q Okay. Why not? If you could explain for the Court.

15 A I think the point is to make the auction safe. I mean,
16 whenever we're -- safe and simple for the bidders. So to
17 get more participation, which increases the amount of value
18 that's created by the auction and benefits both sides. The
19 danger of price fishing. Price fishing was harmful to the
20 auctions in general and would depress participation and
21 would not be good for either advertisers or publishers.

22 Q Now, in the course of your review and preparation of
23 your report, did you cite to at least one competitor, Meta
24 here, who also issued UPR or a version of UPR?

25 A Yes, I did.

1 Q Okay. And then finally if we could go to what's been
2 marked as PTX 1035.

3 MS. RHEE: And apologies. It was not included in
4 the binder, but it is a PTX document. I'm going to hand it
5 up.

6 THE COURT: That's already in evidence, I believe.

7 MS. RHEE: Oh, it is in evidence. All right.

8 THE COURT: 1035, yeah.

9 MS. RHEE: All right. Terrific.

10 BY MS. RHEE:

11 Q And if we could direct your attention, Professor
12 Milgrom, to 4364.

13 MS. WOOD: Can we get copies, please.

14 MS. RHEE: And if we could blow this up.

15 BY MS. RHEE:

16 Q Now, is this a report with respect to the impact of
17 UFPA and the other changes that were bundled?

18 A Yes. That's what it appeared to be, yes.

19 Q Okay. And here in terms of the overall impact to the
20 aggregate publishers rather than a single individual
21 publisher, does this slide show that there is an indirect
22 revenue impact that is positive?

23 A Yeah. It says that 76 out of the top 100 publishers
24 have a positive impact on indirect revenue.

25 Q Okay. Now, finally, Professor Milgrom, did you, in the

1 course of preparing your expert report and opinion, review
2 Professor Weintraub's scale analysis?

3 A Oh, I did, yes.

4 Q Okay. And did you prepare a demonstrative to help the
5 Court walk through your assessment of Professor Weintraub's
6 conclusions?

7 A Yes, I did.

8 MS. RHEE: Okay. So if we could put up --
9 actually, no. It's the corrected slide that Professor
10 Milgrom put together. Okay.

11 BY MS. RHEE:

12 Q So now on the left-hand side of this demonstrative, do
13 you see Plaintiffs' Demonstrative N?

14 A I do, yes.

15 Q Okay. And you're familiar with this demonstrative from
16 Professor Weintraub and his testimony?

17 A I am, yes.

18 Q Okay. And now on the right-hand side, do you provide
19 some corrections?

20 A Yeah. I provide some perspective anyway, yes.

21 Q Okay. And can you walk the Court through the
22 perspective here that you're providing, why -- let's just
23 kind of walk through this in turn.

24 Why have you X'd out the .05 percent that
25 Professor Weintraub uses and replace it with the 1.09?

1 A Yes. The -- the tests that Professor Weintraub -- the
2 conducts he considers, this is the smallest impact any of
3 them have on market share. It's on win rate. 1.09 percent.
4 And this is a real Poirot experiment. It's the one that
5 takes the longest to detect because the effect is smallest,
6 and I wanted to see how that would look instead of this
7 imaginary .05 experiment.

8 Q Okay. And that 1.09, what real experiment that Google
9 actually conducted did you take that smallest actual
10 incremental increase from?

11 A Poirot. With testing the impact of Poirot.

12 Q And once you correct for that and use an actual launch
13 experiment that Google actually conducted and ran, what did
14 you see in terms of the time for the rivals that Professor
15 Weintraub selected to get the same results?

16 A Okay. I want to remind the Court what this is. That
17 the -- these experiments are run taking a 1 percent sample
18 of the data. There's a lot of data flowing through here,
19 and Google has enough data to detect this at a significance
20 level in just a couple of minutes.

21 The other exchanges are smaller, so it takes them
22 longer, but not 30 days. It takes OpenX 44 minutes with a
23 1 percent sample to achieve significance. And Sovrn, which
24 is still smaller, would have taken 90 minutes of a 1 percent
25 sample of their data to detect the significance of the

1 effect the size of Poirrot.

2 Q And is that the reason why you disagree with
3 plaintiffs' position that scale here prevents the
4 competitors from being able to actually run the experiments
5 themselves?

6 A So, you know, I don't want to exaggerate. I don't
7 disagree that you can run an experiment in less time on your
8 larger scale. I said I thought that the plaintiff had
9 exaggerated the importance of scale economies because, at
10 this scale of OpenX or Sovrn, it doesn't take very long to
11 run these experiments. It takes even less time for Google,
12 but this is not an economically-significant disadvantage.

13 MS. RHEE: And with that, we pass the witness,
14 Your Honor.

15 THE COURT: All right.

16 MR. VERNON: Jeff Vernon for the United States. I
17 will try to speak not so loud today. We're passing out some
18 binders and then we can start shortly.

19 Good afternoon, Professor Milgrom.

20 MS. RHEE: Can we get some binders?

21 MR. VERNON: I'm just saying hi.

22 Nice to see you again.

23 THE WITNESS: Nice to see you, too.

24 What am I supposed to do with the docs here? Do I
25 keep the old docs up, too?

CROSS-EXAMINATION

BY MR. VERNON:

Q Okay. Just so you can orient yourselves with the binder, there's one binder with exhibits. We will probably use that the most. Then there are other binders with -- one of them has your report and a depo transcript. Another has other depo transcripts.

A Okay.

Q Let's start with last look.

I think you testified on direct that, overall, last look does not create an inherent advantage for AdX; is that correct?

A It does not. That's right.

Q But you would also agree that if publishers do not inflate bids -- and inflating bids is what we were talking about before where you -- the publisher can boost the value CPM; do you remember that?

A Of course I remember that. Yes.

Q Okay. If publishers do not inflate bids, last look creates a competitive advantage for AdX over exchanges competing in header bidding; correct?

A Not quite. That's close, but not quite.

Q I'll try again.

THE COURT: Well, wait. Why don't you explain to me why you have that answer.

1 THE WITNESS: Oh, well, the -- there's no
2 advantage if the publisher sets a higher floor price than
3 the header bid, which it can do by inflating or just setting
4 high floor prices and so on. Basically it's high floor
5 prices that create the disadvantage that offsets the
6 advantage of last look.

7 THE COURT: Because the bid might not go through?

8 THE WITNESS: Right.

9 THE COURT: In other words, it's too high?

10 THE WITNESS: Either both -- for both of those
11 reasons.

12 They may fail to win, as we saw evidence in that
13 tree picture, that header bidding might win even because the
14 Google floor price is even higher than the inflated line
15 item, and because the price that the winner pays might be
16 higher on account of the higher floor price.

17 BY MR. VERNON:

18 Q So let's set aside floors and set aside bid inflation.

19 If you set aside those two things, last look
20 creates a competitive disadvantage for exchanges bidding
21 through header bidding; correct?

22 A In that case, it would create a competitive
23 disadvantage, yes.

24 Q And you do not know how often publishers conflate bids;
25 correct?

1 A I don't have any data about that. I only have the
2 descriptions, and it did say that it's common.

3 Q And you remember that when I asked you at your
4 deposition if you knew how common bid inflation was prior to
5 the Uniform First Price Auction, which is when last look was
6 in effect, you said I do not know; is that right?

7 A That's possible, yep.

8 Q You have not analyzed whether there are downsides to
9 inflating bids; right?

10 A I didn't analyze that in my report, no.

11 Q You have not spoken to publishers about how often they
12 inflate bids; correct?

13 A I have not spoken to them about that, that's right.

14 Q You have not spoken to publishers about whether there
15 are downsides to inflating bids; correct?

16 A I didn't speak to publishers in the process of creating
17 this report.

18 Q You have not reviewed any deposition testimony from
19 publishers or from any other industry participants about how
20 often publishers inflate bids or whether it has downsides;
21 correct?

22 A That's correct.

23 Q And you are aware that there are at least some
24 publishers that do not inflate bids; is that right?

25 A Yes, I am aware that there are some.

1 Q So with respect to at least those publishers, last look
2 gave AdX an advantage; correct?

3 A Last look was implemented by those publishers in a way
4 that gave AdX an advantage.

5 Q Let's try to break this down mechanically.

6 With last look -- and let's do before Open Bidding
7 to keep things simple; is that okay?

8 A That's fine with me.

9 Q With last look, AdX gets to see the highest other bid
10 from header bidding through the floor; correct?

11 A We're talking about without the bid inflation and so
12 on. What are we -- I'm sorry?

13 Q Just to simplify -- and, again, you can always discuss
14 this with your counsel later. Let's talk about the period
15 before Open Bidding and assume no bid inflation and the
16 floors don't affect this; is that correct?

17 A In other words, we're assuming that the floors are
18 equal to the highest header bid; is that a yes what you
19 mean?

20 Q Yes.

21 A Okay. Good. Now I understand the question. Okay.

22 Q Okay. So before header bidding through last look, AdX
23 sees the highest other bid from header bidding; correct?

24 A If that's what is passed to them, that's right.

25 Q And before Open Bidding, no other exchange saw that

1 information; correct?

2 A Before Open Bidding, no other exchange saw, yes.

3 Q And with a -- so at this time, AdX ran a second-price
4 auction; is that right?

5 A It did.

6 Q And the other exchanges, as you discussed, ran a
7 first-price auction; is that right?

8 A The other exchanges were moving to first-price
9 auctions, the header bidding auction.

10 Q Okay.

11 A Who was running a first-price auction did you ask me?

12 Q The exchanges other than AdX during this time period
13 were either running a first-price auction or were moving
14 there; is that what you said?

15 A Yeah. They were moving towards first-price auctions.

16 Q Okay. And so with AdX running a second-price auction
17 and having a last look, what happened was the price that AdX
18 would win at or an AdX's buyer would win at, would
19 automatically match the highest bid from header bidding if
20 AdX did not have two bids above the floor; correct?

21 A If AdX did not have -- yes, that's correct.

22 Q And that was not true for any other exchanges; is that
23 right?

24 A What wasn't true? I'm sorry. What's not true?

25 Q During this time period when last look applied, it was

1 not true that the other exchanges would automatically win at
2 the price, that is the price of the highest other bid, the
3 way that AdX did; correct?

4 A The other exchanges weren't involved in this auction.
5 We're talking about the AdX auction, and are you -- you're
6 comparing it to some other auction that I don't -- I don't
7 know what you're comparing it to. I'm sorry.

8 Q Let me try to break it down a little bit.

9 So as we discussed, through last look, if AdX had
10 only one bid above the floor, AdX would, and its buyer,
11 would automatically win at the price that was the same as
12 the price that the highest other bid; correct?

13 A The same as the floor. The highest header bid if
14 that's setting the floor, yes.

15 Q And there was no mechanism at that time to allow other
16 exchanges to automatically win at the price equal to the
17 highest other bid if they only had one bid above it;
18 correct?

19 A I'm not aware of any mechanism that would let another
20 exchange to do that.

21 Q So that was an advantage to AdX at that time; correct?

22 A AdX ran Dynamic Allocation, and it was an advantage for
23 them under the conditions we've stated.

24 Q Okay. And so now let's add sell-side DRS to the
25 equation.

1 When last look applied and AdX used sell-side DRS,
2 AdX could see the highest other bid from header bidding and
3 then adjust its take rate up or down so that it would win at
4 exactly the price set by header bidding; correct?

5 A If the highest bid -- if the floor was set by a header
6 bid, and of course if the floor was set by the publisher, as
7 it often was, then it wouldn't be correct, but it's correct
8 whenever the price is set by the header bid.

9 Q Okay. And no other at that time -- no other exchange
10 participating in DFP's auction had that ability to see the
11 highest other bid and then adjust their take rate afterwards
12 so they could win at exactly the highest other bid; correct?

13 A No other exchanges had that, but the DRS also allowed
14 the AdX to clear when the price was set by others and clear
15 additional impressions that way.

16 Q But this did give AdX an advantage; is that fair?

17 A It did give AdX an advantage yes.

18 Q As it's as if AdX could open the sealed envelope and
19 then change its take rate after that; is that right?

20 A As if -- yeah, I guess.

21 Q And no other exchange had the ability to open the
22 envelope and change its take rate; correct?

23 A No other exchange could do that in AdX's auction,
24 that's right.

25 Q Okay. Let's turn to PTX 528 in your binder. They are

1 marked sequentially, so it's sort of towards the beginning.

2 MR. VERNON: And the United States will move to
3 admit 528.

4 THE COURT: Any objection? Again without the
5 comments.

6 MR. VERNON: Yes. For this, Your Honor, the
7 comments are not mission critical.

8 MS. RHEE: Was this cited in Professor Milgrom's
9 report?

10 MR. VERNON: No, it was not, but we are asking
11 about the advantages of last look. I think that's relevant,
12 and that's what this document relates to.

13 MS. RHEE: No objection, Your Honor.

14 THE COURT: All right. It's in.

15 (Plaintiff Exhibit Number 528 admitted into evidence.)

16 BY MR. VERNON:

17 Q So this is a document titled "Proposal Jedi No Last
18 Look"; do you see that?

19 A Are these going to be the same so I can look over here?

20 Q It should. We will try to make it the same. If we
21 don't quite get there, apologies.

22 MS. RHEE: I'm sorry, what PTX are we looking at?

23 THE COURT: It should be 528.

24 MS. RHEE: Oh, I see it. Apologies.

25 BY MR. VERNON:

1 Q Okay. So this is a document titled "Proposal Jedi No
2 Last Look"?

3 A That's the title of the document, yes.

4 Q And you remember Jedi was a code word for Open Bidding?

5 A Yes.

6 Q Let's look at the paragraph that's about two-thirds of
7 the way down called benefits.

8 A Benefits. Okay.

9 Q And the first line reads: "The primary benefit of
10 giving up last look is" -- and underlining -- "creating a
11 level playing field for all exchanges, including AdX and
12 Jedi"; do you see that?

13 A I see that.

14 Q This sentence is at least implying that last look
15 creates an unlevel playing field for exchanges; is that
16 fair?

17 A Yeah, it seems to imply that.

18 Q The next sentence reads: "Currently, AdX has an
19 advantage where its closing price can depend on bid from
20 another exchange"; do you see that?

21 A I see that.

22 Q And that's consistent with what we were talking about
23 before where we talked about how at this time, prior to Open
24 Bidding, and, again, assuming no bid inflation, AdX had an
25 advantage, because if it only had one bid above the floor,

1 it would automatically win at the highest other bid; is that
2 right?

3 A That's right. Reminder that last look isn't a Google
4 program, it's a result of the interaction in which header
5 bidding was used, but yes.

6 Q Okay. You can set that document aside.

7 Let's turn to PTX 542. For reference, there are
8 two versions of 542, one has been redacted, one has been
9 not. You're free to use either one that you want. It's
10 already been admitted into evidence.

11 Now, the Court has already seen this document, so
12 I will move quickly. Let's focus on the email from Martin
13 Pal at the bottom of the page.

14 There is a paragraph that starts three paragraphs
15 down with the words "this has fundamentally"; do you see
16 that? Let me know when you're there.

17 A I see the statement that you've highlighted, yes.

18 Q This reads: "This has fundamentally nothing to do with
19 Dynamic Rev Share. Dynamic Rev Share is just another way
20 for AdX to exploit the last-look advantage"; do you see
21 that?

22 A Yeah. I don't know what this refers to; however -- can
23 I read before?

24 Q Sure. Go ahead. Or I can read it to you if that's
25 easier.

1 A That's all right. Hang on.

2 Yes, I see that. Okay. I disagree with it, by
3 the way. I've seen this before.

4 Q Let's go -- okay. So let's go to the phrase "yet
5 another way for AdX to exploit the last-look advantage"; do
6 you see that?

7 A Yes.

8 Q That's consistent with what we discussed before where,
9 at this time, again, setting aside bid inflation and setting
10 aside Open Bidding, AdX and only AdX had the last look and
11 could change its take rate through sell-side DRS; is that
12 right?

13 A Yes, that's right.

14 Q Okay. And you agreed that the combination of last look
15 and sell-side DRS creates a disadvantage for exchanges other
16 than AdX; correct?

17 A The combination each has -- each has its own advantage,
18 but they create a disadvantage as you've described.

19 Q Okay. You can set that aside.

20 One more document on last look.

21 MS. RHEE: Apologies, Your Honor. Can we just get
22 Professor Milgrom some additional water? He seems to be
23 coughing a lot.

24 THE WITNESS: I'm sorry, Your Honor, I've had a
25 little cough today.

1 MS. RHEE: What document are you looking at?

2 MR. VERNON: PTX 1709.

3 THE WITNESS: Okay.

4 MR. VERNON: Which I believe has already been
5 admitted.

6 MS. RHEE: Well, hold on one second.

7 MS. WOOD: It has been.

8 MS. RHEE: Okay. Thank you.

9 MR. VERNON: Thank you.

10 BY MR. VERNON:

11 Q So it's kind of towards the back if that helps.

12 You were aware of the Facebook Audience Network;
13 is that right?

14 A Yes, I'm aware of it.

15 Q The Facebook Audience Network previously acquired open
16 web display ads; is that right?

17 A Previously acquired open web -- is open-web display ads
18 the name of a company? Is that what you're saying?

19 Q No. It's not super important. But the question is, at
20 one point in time, the Facebook Audience Network acquired
21 open-web display ads; is that right?

22 A I'm sorry. You've used the word "acquired." Are you
23 talking about bidding? Is that the name of a company? I
24 don't know what we're talking about.

25 Q Bidding is fine.

1 The Facebook Audience Network bid on open-web
2 display ads at one point in time; correct?

3 A They bid for display ads, yeah. Uh-huh.

4 Q And you were aware that the Facebook executives who
5 were involved in this Facebook Audience Network product
6 believed that last look created a disadvantage for Facebook
7 as a bidder; correct?

8 A Is that in here?

9 Q We'll get there. I'm just asking if you're aware.

10 A I was not aware.

11 Q Let's turn to a page ending in 934. It's the second
12 page. And let's focus on the bullet points at the very
13 bottom. It's the third bullet point from the bottom, the
14 way that Google operates. This reads: "The way that Google
15 operates, AdX significantly disadvantages other competitors.
16 AdX gets last look, meaning they can bid 1 cent higher than
17 the highest bidder and win"; do you see that?

18 A And as I've described, the -- that's -- being able to
19 peak doesn't create an advantage like that, because it
20 doesn't matter whether you bid 1 cent higher or \$1 higher,
21 you pay the same price.

22 Q You can get to that with your counsel.

23 This is a document from an industry --

24 MS. RHEE: Your Honor, if we could just refrain
25 from the commentary. He's responding to a question that's

1 posed by the government lawyer.

2 THE COURT: All right. But, Professor, it's also
3 best in court to simply answer yes or no without the added
4 tail, so to speak.

5 THE WITNESS: All right.

6 THE COURT: And it will be easier on your throat.

7 THE WITNESS: Thank you, Your Honor.

8 THE COURT: The case will go faster, and we'll
9 have less of this back-and-forth. Ms. Rhee is listening.
10 If there's something that is raised in a question and your
11 yes-or-no answer she can, on redirect, clarify; all right?

12 THE WITNESS: Thank you.

13 BY MR. VERNON:

14 Q This is a document from an industry participant,
15 meaning the Facebook Audience Network, where this industry
16 participant says that last look significantly disadvantages
17 it as a competitor; correct?

18 A Yes.

19 Q This is not a document where Facebook is saying last
20 look actually disadvantages AdX; correct?

21 A It's -- this part of the document -- I haven't seen the
22 whole document, but that's right.

23 Q The line below that reads: "This means that although
24 we now have access to the inventory we want in web, our
25 ability to compete fairly for it is handicapped"; do you see

1 that?

2 A I see it, yes.

3 Q And, again, this is another sentence saying that last
4 look was a disadvantage for Facebook; is that correct?

5 A It appears to be that, yes.

6 Q This is not a place where Facebook is saying that last
7 look is a disadvantage for AdX; is that correct?

8 A These sentences certainly don't say that, right.

9 Q You can set that aside.

10 A Okay.

11 Q You did not analyze whether last look harmed
12 competition among exchanges; is that correct?

13 A No, I didn't analyze that directly, no.

14 Q Okay. You did not do a full analysis of the impact of
15 last look on competition; is that fair?

16 A I did not do a full analysis of last look on
17 competition, yes, that's correct.

18 Q So you were not offering an opinion about whether any
19 harm to competition from last look is larger or smaller than
20 the benefits that could result from last look; is that
21 right?

22 A I'm not offering an opinion.

23 MR. VERNON: Your Honor, we're about to switch to
24 another topic. If you prefer, we can keep going, or if you
25 prefer, we can go to lunch.

1 THE COURT: Oh, it's 1:00. All right. Yes.
2 We'll break for lunch until 2:00.

3 MR. VERNON: Thank you, Your Honor.

4 (Court recessed for lunch at 1:00 p.m.)

5 -----

6 I certify that the foregoing is a true and accurate
7 transcription of my stenographic notes.

8
9 

10 Stephanie M. Austin, RPR, CRR

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25